THE B&B LINE

TRADE-MARK

WORLD'S MOST COMPLETE LINE

HEATING [illegible]

# MODERN HEATING AND VENTILATING

The Bishop & Babcock Sales Co.

4901-4915 Hamilton Ave., N. E.
CLEVELAND, OHIO

INTERNATIONAL

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# WORLD'S MOST COMPLETE LINE

# Heating Specialties and Ventilating Equipment

## For All Services

FIFTH EDITION

JANUARY, 1928

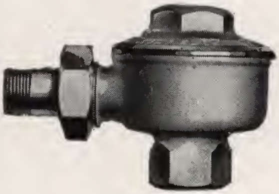
THE BISHOP & BABCOCK SALES CO.
General Offices: 4901-4915 Hamilton Ave., N. E.
CLEVELAND, OHIO

# The B & B Line of No. 6 Multiflex-Traps

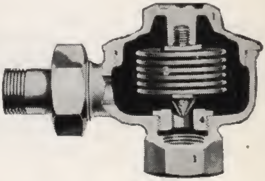
The No. 6 Multiflex-Trap is a thermostatic return valve which allows the passage of air and water of condensation, automatically and noiselessly, without escape of steam, into the return piping. Positive seating is accomplished by the cone valve and sharp edged seat used, and which insures against the escape of steam.

The No. 6 Multiflex-Trap is supplied in 3 sizes and numerous patterns. Each type is fitted with a Multiflex Thermal Member made from a special composition brass, corrugated into six folds, or corrugations, having 12 flexing surfaces. This distributes the deflection equally over all the surfaces.

The thermal member is filled with a volatile liquid, hermetically sealed under twenty-two inches vacuum and individually tested. Steam in contact with the thermal member vaporizes the volatile liquid, in turn expands and closes the trap preventing escape of steam; air and water of condensation cools the thermal member, and the trap opens, permitting both air and water of condensation to pass, and again closes. Thorough drainage and air elimination are assured with positively the highest efficiency.



Exterior



Interior

½″, ¾″ and 1″ Multiflex Traps No. 6

Sizes, patterns, serial numbers and weights of No. 6 Multiflex Traps are as follows:

| Size and Type In. | Serial Number | Net Weight Lbs. |
|---|---|---|
| ½ No. 6 Angle | 9305 | 2 |
| ½ No. 6 S. W. | 9315 | 2 |
| ½ No. 6 R. H. | 9325 | 2 |
| ½ No. 6 L. H. | 9335 | 2 |
| ¾ No. 6 Angle | 9355 | 3½ |
| ¾ No. 6 S. W. | 9365 | 3½ |
| ¾ No. 6 R. H. | 9375 | 3½ |
| ¾ No. 6 L. H. | 9385 | 3½ |
| 1 No. 6 Angle | 9395 | 4 |
| 1 No. 6 S. W. | 9405 | 4 |
| 1 No. 6 R. H. | 9415 | 4 |
| 1 No. 6 L. H. | 9425 | 4 |

By the use of No. 6 Multiflex Traps, radiators and coils are always maintained at the steam or vapor temperature, through positive removal of air and water of condensation.

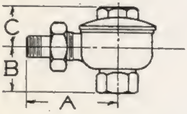
# No. 6 Multiflex-Trap

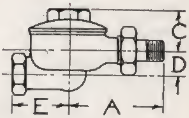
## For Low Pressures

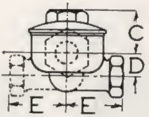
### Specifications

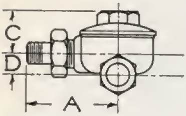
1. Body and cap heavy bronze castings with metal to metal joints heavily nickeled with polished trimmings.
2. Thermal member is special composition brass, heat treated and filled with volatile liquid which expands and contracts according to temperature closing or opening the valve.
3. Cone valve and sharp edge seat made from best steam brass insures positive seating. Extra large valve opening prevents dirt accumulation. Seats are renewable.
4. Each trap provided with an extra heavy swivel and nut containing ground ball and socket joint.
5. Operates on varying pressures up to 15 pounds.

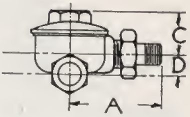
### Roughing-in Dimensions











| Size | A | B | C | D | E |
|---|---|---|---|---|---|
| ½" | 3⅜" | 1⅝" | 1½" | ¾" | 2" |
| ¾" | 3 15/16" | 1 9/16" | 1½" | 29/32" | 2 5/16" |
| 1" | 4¾" | 1⅞" | 1⅞" | ⅞" | 3¼" |

The PERFORMANCE of the No. 6 Multiflex Trap on various types of service is as follows, based on square feet of Radiating Surface.

| Size and No. | Direct Radiation | | Direct Indirect Radiators | | Indirect Radiators | | Coil or Wall Radiators | |
|---|---|---|---|---|---|---|---|---|
| | Vacu Vapor | Return Line | Vacu Vapor | Return Line | Vacu Vapor | Return Line | Vacu Vapor | Return Line |
| ½"-6 | 0-150 | 0-200 | 0-100 | 0-140 | 0-90 | 0-120 | 0-120 | 0-160 |
| ¾"-6 | 151-400 | 201-500 | 101-260 | 141-340 | 91-230 | 121-280 | 121-320 | 161-400 |
| 1"-6 | 401-800 | 501-1000 | 261-550 | 341-680 | 231-400 | 281-600 | 321-640 | 401-800 |

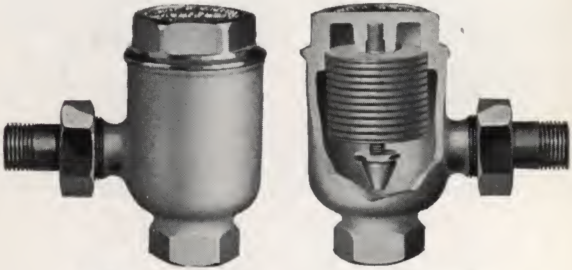
# The B&B Line of Multiflex Traps

To meet conditions of sensitiveness for varying steam and vacuum pressures the B & B Line of Multiflex Return Traps is offered. They are essentially a low pressure trap and should not be used where the steam pressure is over 10 pounds. For high pressure see page 8.

The Multiflex Return Trap is a thermostatic valve for use with vapor and vacuum systems of steam circulation. It is used on the return ends of radiators, coils, drip points and on blast heaters. Steam in contact with the thermal member vaporizes the volatile liquid hermetically sealed in the thermal member and closes the valve tightly, preventing the escape of steam. Air and water of condensation cools the member and causes it to contract and open the valve. The Multiflex thermal member is made from a special composition brass, corrugated into thirteen folds or corrugations, having 26 flexing surfaces. This distributes the deflection equally over all the surfaces.

Air and water of condensation are passed noiselessly, automatically and efficiently.

## No. 3 Multiflex Trap



Exterior

Interior

½″, ¾″ and 1″ Multiflex Traps

Sizes, patterns, serial numbers and weights of No. 3 Multiflex Traps are as follows:

| Size and Type Inches | Serial No. | Net Weight Lbs. |
|---|---|---|
| ½″ No. 3 Angle | 2355B | 2½ |
| ½″ No. 3 S. W. | 4535B | 2½ |
| ½″ No. 3 R. H. | 4545B | 2½ |
| ½″ No. 3 L. H. | 4555B | 2½ |
| ¾″ No. 3 Angle | 4565 | 3 |
| ¾″ No. 3 S. W. | 4595 | 3 |
| 1″ No. 3 Angle | 4575 | 3½ |

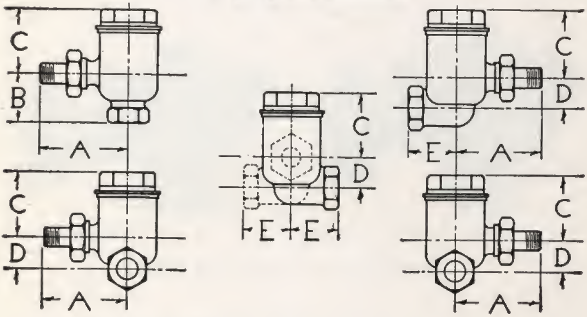
# No. 3 Multiflex Trap

## For Low Pressures

### Specifications

1. Body and cap heavy bronze castings with metal to metal joints, heavily nickeled with polished trimmings.
2. Thermal member special composition brass, heat treated and filled with volatile liquid and hermetically sealed by the B & B process.
3. Conical valve and sharp edge seat, made from best steam brass, insures positive seating. Extra large valve opening prevents dirt accumulation.
4. Each trap provided with an extra heavy swivel and nut containing ground ball and socket joint.
5. Operates on varying pressures up to 10 pounds.

### Roughing-in Dimensions



| Size and No. | A | B | C | D | E |
|---|---|---|---|---|---|
| ½"—3 | 3¼ | 1⅜ | 2½ | 1⅛ | 1¾ |
| ¾"—3 | 3½ | 2 | 3⅜ | ⅞ | 1⅞ |
| 1"—3 | 4 | 2 | 3¼ | — | — |

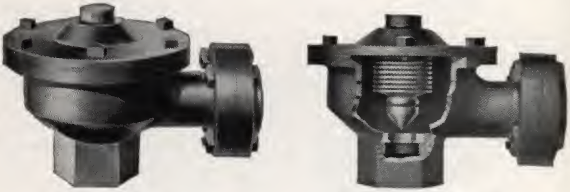
The PERFORMANCE of this type of trap on different work appears in the following table based on square feet of radiating surface.

| Size and No. | Direct Radiation | | Direct Indirect | | Indirect Radiation | | Wall and Coil Radiation | |
|---|---|---|---|---|---|---|---|---|
| | Vacu Vapor | Return Line | Vacu Vapor | Return Line | Vacu Vapor | Return Line | Vacu Vapor | Return Line |
| ½"—3 | 0–200 | 0–250 | 0–150 | 0–175 | 0–130 | 0–150 | 0–170 | 0–200 |
| ¾"—3 | 201–500 | 251–600 | 151–350 | 176–425 | 131–300 | 151–350 | 171–430 | 201–500 |
| 1"—3 | 501-1000 | 601-1100 | 351–700 | 426–750 | 301–625 | 351–700 | 431–825 | 501–900 |

# The B&B Line of No. 3 Multiflex Traps

## For Low Pressure, 1¼″ and 1½″ Iron Body

A larger size of No. 3 Multiflex Trap for 1¼″ and 1½″ Pipe connections is offered for Industrial uses, and also in connection with the B & B Return Line systems. This trap is equipped with a thermal member of the Multiflex Type made of special composition brass and extra heavy to meet the heavy duty for which purpose it is designed. The thermal member contains the exact quantity and quality of volatile liquid suitable for the service for which it will be used, which expands and contracts according to temperature thus closing and opening the valve.



Exterior

Interior

1¼″ and 1½″ No. 3 Multiflex Trap

Sizes, patterns, serial numbers and weights of Type No. 3 Multiflex Trap are as follows:

| Size and No. | Serial No. | Net Weight Lbs. |
|---|---|---|
| 1¼″—3 Angle | 665A | 15½ |
| 1½″—3 Angle | 675A | 15½ |

This trap furnished in angle pattern only.

The quantity and quality of the volatile liquid with which such members are filled is of similar importance and the B & B Line is a perfected line in this respect. Perfect flexibility coupled with a perfect volatile liquid produce an evenness of operation in which the B & B Line excel. These features permit the use of an unusually large orifice in the seat of the Multiflex Return Traps, and they handle accordingly a greater amount of condensation than any other return trap of equal size on the market.

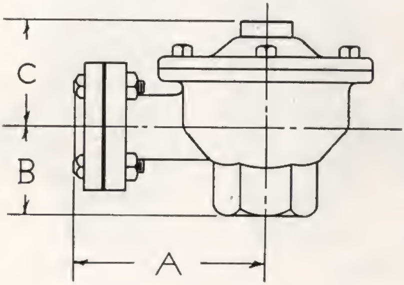
# The B&B Line of No. 3 Multiflex Traps

## For Low Pressures, 1¼″ and 1½″ Sizes

### Specifications

1. Body and cover heavy iron castings. Cover removable and fastened to body by 6 brass cap screws. Traps painted black.
2. Thermal member special composition brass, heat treated and filled with volatile liquid and hermetically sealed by the B & B process.
3. Conical valve and sharp edged seat, made from best steam brass, insures positive seating. Extra large valve opening prevents dirt accumulation. Valve and seat are renewable.
4. Companion flange for inlet furnished as standard equipment. Outlet screwed.
5. Operates on varying pressures up to 15 pounds.
6. Like all B & B products these traps are factory tested and adjusted, there is no adjustment required when installing, or in service. This type of trap is furnished in angle pattern only.

### Roughing-in Dimensions



| Size Inches | Type | Serial No. | A | B | C |
|---|---|---|---|---|---|
| 1¼″ | Angle | 665A | 6 | 2¾ | 3⅜ |
| 1½″ | Angle | 675A | 6 | 2¾ | 3⅜ |

The Performance of Type No. 3, Iron Body Multiflex Traps is as follows, based on square feet of radiating surface·

| Size | Direct Radiators | Direct Indirect Radiators | Indirect Radiators | Coils or Wall Radiator |
|---|---|---|---|---|
| 1¼ No. 3 | 1001–2500 | 681–1600 | 601–1400 | 801–2000 |
| 1½ No. 3 | 2501–3500 | 1601–2400 | 1401–2000 | 2001–2800 |

Above Traps for indirects are for gravity ventilation. For fan systems estimate equivalent direct. C×R÷.25.

Use full opening valves for indirect radiators.

C=Condensation for velocity and final temperature
R=Radiating surface.

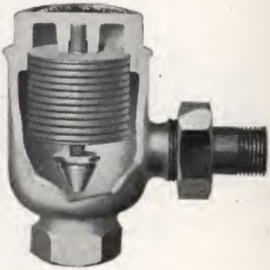
# The B&B Line of No. 3A Multiflex Traps

### For Medium Pressure

The B & B Line of No. 3A Multiflex Traps is similar to the No. 3 with the exception that the thermal member is especially constructed and filled with the exact quantity of volatile liquid suitable for this service, and which tightly closes the valve on its seat when in contact with Steam.

This liquid must be sensitive enough to contract on contact with higher temperature condensate as met with under higher pressures, and this feature causes the B & B Line of Medium Pressure Multiflex Traps to be decidedly useful.

Exterior



Interior

The sizes, serial numbers and weights in which this Type No. 3A Multiflex Traps are offered are as follows:

| Size and Type Inches | Serial No. | Net Weight |
|---|---|---|
| ½″ No. 3A Angle | 6045 | 2½ |
| ½″ No. 3A S. W. | 6055 | 2½ |
| ½″ No. 3A R. H. | 6065 | 2½ |
| ½″ No. 3A L. H. | 6075 | 2½ |
| ¾″ No. 3A Angle | 6085 | 3 |
| ¾″ No. 3A S. W. | 6095 | 3 |

It is impossible to blow out the thermal member, and HIGH Pressures will not injure the thermal member although at above 50 pounds pressure this trap will pass steam. The No. 3A Multiflex Trap is equipped with a monel metal valve and seat. The B & B thermal members making use of liquids that produce definite vapor tensions yield an evenness of operation obtainable in no other way.

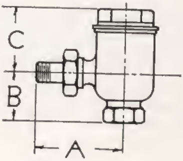
# The No. 3A Multiflex Trap

### Specifications

1. Body and cover heavy bronze castings with metal to metal joints, heavily nickeled with polished trimmings.
2. Thermal member special composition brass, heat treated and filled with volatile liquid hermetically sealed by the B & B process.
3. Conical valve and sharp edge seat insures positive seating, and extra large valve opening prevents dirt accumulation.

   This trap equipped with renewable MONEL METAL valve and seat.
4. Each trap provided with an extra heavy swivel and nut containing ground ball and socket joint.
5. Operates on pressures varying from 25 to 40 pounds.

### Roughing-in Dimensions



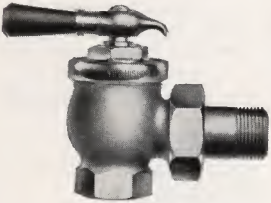
| Size and No. | A | B | C |
|---|---|---|---|
| ½″ 3A | 3¼ | 1⅜ | 2½ |
| ¾″ 3A | 3½ | 2 | 3⅜ |

Performance:—The No. 3A Multiflex Traps, furnished in ½″ and ¾″ sizes, have the following capacities, based on square feet of radiating surface:

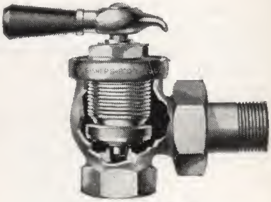
| Size and No. | Maximum Capacity Sq. Ft. Direct |
|---|---|
| ½″ No. 3A | 100 |
| ¾″ No. 3A | 200 |

# The B&B Line of Special Multiflex Modulation Valves

The B&B Multiflex Modulation Valve insures of accurate control of steam entering radiators in vapor and vacuum heating installations. The regulation is self-indicated on the dial, from shut to full open. It is all-metal construction, packless and leakage is impossible, there being no packing boxes. Multiflex bellows replace all packing. One-half turn of the lever closes the valve tightly. This valve is a steam and water tight valve, with valve lift obtained by ½ turn, graduated into open, ¾ open, ½ open, ¼ open and shut.



Exterior



Interior

The merits of this valve are tabulated as follows:

1. All-metal construction, handsomely finished in full nickel.
2. Moving parts of special wear-resisting metal.
3. ½ turn of handle opens full from shut to full opening, modulation correct.
4. Large steam port, renewable Jenkins disc, full lift.
5. Packless, multiflex bellows insures a steam and water tight valve.
6. Extra heavy swivel and nut.
7. All parts interchangeable.

Sizes, patterns and weights of the B&B Line of Special Multiflex Modulation Valves are as follows:

| Size Inches | Pattern | Serial No. | Weight Lbs. |
|---|---|---|---|
| ½ | Angle | 9485 | 1½ |
| ¾ | Angle | 9525 | 1¾ |
| 1 | Angle | 9565 | 2 |
| 1¼ | Angle | 9605 | 3 |
| 1½ | Angle | 9645 | 5 |
| 2 | Angle | 9655 | 7½ |

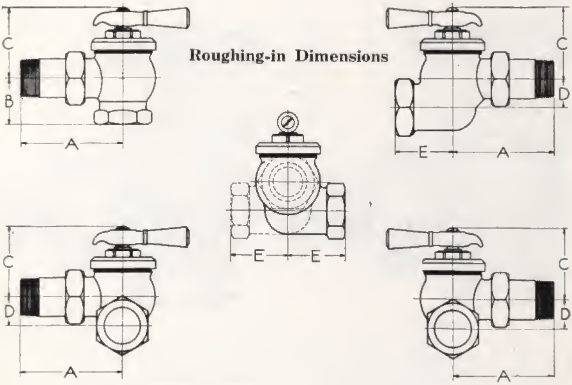
| | | |
|---|---|---|
| ½ | S. W. | 9495 |
| | R. H. | 9505 |
| | L. H. | 9515 |
| ¾ | S W. | 9535 |
| | R. H. | 9545 |
| | L. H. | 9555 |
| 1 | S. W. | 9575 |
| | R. H. | 9585 |
| | L. H. | 9595 |
| 1¼ | S. W. | 9615 |
| | R. H. | 9625 |
| | L. H. | 9635 |

# The B&B Line of Special Modulation Valves

## Specifications, Roughing-in and Performance Data

1. Body and bonnet of the best steam brass, fully nickeled.
2. Valve stem, stem guide and disc holder of the best steam brass accurately machined.
3. Diaphragm, heavy B&B Multiflex Bellows of special composition brass.
4. Disc holder contains, renewable Jenkins disc.
5. Swivel and nut extra heavy brass, nickeled finished.

All parts are interchangeable, and the trimmings of the valve full nickeled polished. This is a handsome and efficient Modulation Valve.



| Size | A | B | C | D | E |
|---|---|---|---|---|---|
| ½″ | 2 21/32″ | 1⅜″ | 2 13/32″ | 21/32″ | 1⅝″ |
| ¾″ | 3″ | 1 13/32″ | 2 15/32″ | 23/32″ | 1 11/16″ |
| 1″ | 3⅜″ | 1 9/16″ | 2⅜″ | 31/32″ | 1 15/16″ |
| 1¼″ | 3¾″ | 1 23/32″ | 3 1/32″ | 1″ | 2⅛″ |
| 1½″ | 4 5/16″ | 2¼″ | 3 1/32″ | | |
| 2″ | 4½″ | 2 9/16″ | 3 7/16″ | | |

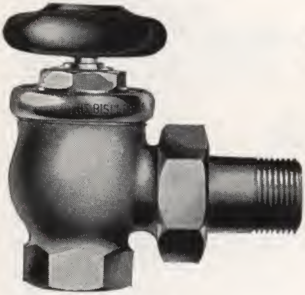
The Performance and capacity of the B&B Line of Special Modulation Valves on different service are as follows:

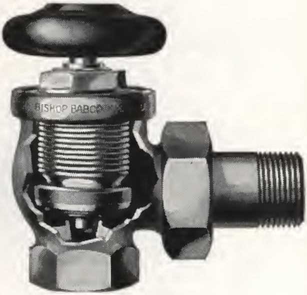
| Size | Direct Radiation | |
|---|---|---|
| In. | Vacu Vapor | Return Line |
| ½ | 0 to 20 | 0 to 25 |
| ¾ | 21– 60 | 26– 75 |
| 1 | 61–120 | 76–150 |
| 1¼ | 121–200 | 151–300 |
| 1½ | 201–350 | 301–500 |
| 2 | 351–450 | 501–650 |

# The B&B Line of Special Multiflex Radiator Valves

## Full Opening Type

The B&B Line of full opening valves is standard equipment for vapor, vacuum, one and two pipe steam, and for hot water installations. The valve is an all-metal packless type, durably constructed out of the best steam brass, fully nickeled and adjusted, and tested at the factory. The valve contains one Multiflex Bellows Diaphragm surrounding the valve stem. Steam, water and air-tight valves and without the use of gaskets, packing or stuffing boxes. Jenkin discs are used. This type furnished with composition handles, less than two turns of which opens full or closes tight the valve on its seat. All operating parts are not in direct contact with steam or water.


Exterior


Interior

Sizes, patterns, serial numbers and weights of the B&B Line of Special Multiflex full Opening Valves are as follows:

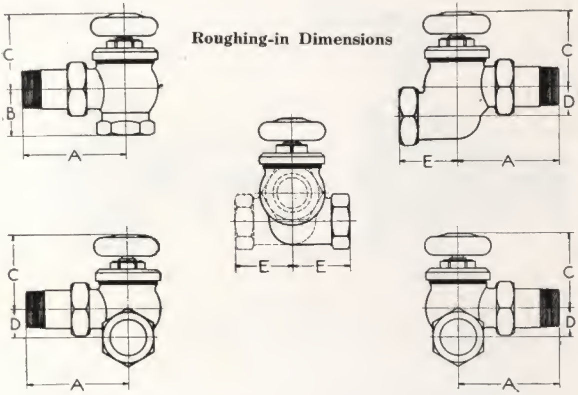
| Size Inches | Pattern | Serial Number | Weight Lbs. |
|---|---|---|---|
| ½ | Angle | 9665 | 1½ |
| ½ | S. W. | 9675 | 1½ |
| ½ | R. H. | 9685 | 1½ |
| ½ | L. H. | 9695 | 1½ |
| ¾ | Angle | 9705 | 1¾ |
| ¾ | S. W. | 9715 | 1¾ |
| ¾ | R. H. | 9725 | 1¾ |
| ¾ | L. H. | 9735 | 1¾ |
| 1 | Angle | 9745 | 2 |
| 1 | S. W. | 9755 | 2 |
| 1 | R. H. | 9765 | 2 |
| 1 | L. H. | 9775 | 2 |
| 1¼ | Angle | 9785 | 3 |
| 1¼ | S. W. | 9795 | 3 |
| 1¼ | R. H. | 9805 | 3 |
| 1¼ | L. H. | 9815 | 3 |
| 1½ | Angle | 9825 | 5 |
| 2 | Angle | 9835 | 7½ |

# The B&B Line of Special Full Opening Valves

## Specifications, Roughing-in and Performance Data

1. Body, bonnet of the best steam brass, fully nickeled.
2. Valve stem, valve stem guide and disc holder of best steam brass, accurately machined.
3. Diaphragm, heavy B&B Multiflex Bellows of special composition brass.
4. Valve, Jenkins disc, held in disc holder.
5. Swivel and nut, extra heavy, finished in nickel.
6. For pressures up to 25 pounds.

All parts interchangeable, the valve being factory tested and adjusted.


**Roughing-in Dimensions**

| Size | A | B | C | D | E |
|---|---|---|---|---|---|
| ½ ″ | 2 21/32″ | 1⅜″ | 2 17/32″ | 21/32″ | 1⅝″ |
| ¾ ″ | 3 ″ | 1 13/32″ | 2 19/32″ | 23/32″ | 1 11/16″ |
| 1 ″ | 3⅜″ | 1 9/16″ | 2½″ | 31/32″ | 1 15/16″ |
| 1¼″ | 3¾″ | 1 23/32″ | 3 5/32″ | 1 ″ | 2⅛″ |
| 1½″ | 4 5/16″ | 2¼″ | 3 5/32″ | | |
| 2 ″ | 4½″ | 2 9/16″ | 3 9/16″ | | |

The performance and capacity of the B&B Line of Special Full Opening Valves on the different heating systems on which it may be used as follows:

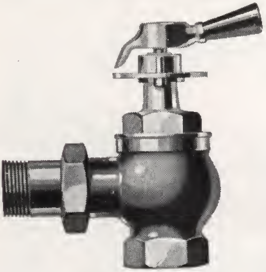
**Square Feet of Radiation**

| Size In. | Vacu Vapor | Return Line | One Pipe | Hot Water |
|---|---|---|---|---|
| ½ | 0 to 20 | 0 to 25 | | |
| ¾ | 21– 60 | 26– 75 | | 0 to 21 |
| 1 | 61–120 | 76–150 | 0–30 | 21– 55 |
| 1¼ | 121–200 | 151–300 | 31– 60 | 56–150 |
| 1½ | 201–350 | 301–500 | 61– 80 | 151–225 |
| 2 | 351–450 | 501–650 | 81–130 | 226– |

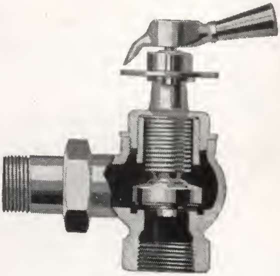
Made in the following patterns: Angle, straightway, right and left hand.

# The B&B Line of Multiflex Modulation Valves

The B&B Multiflex Modulation Valve insures of accurate control of steam entering radiators in vapor and vacuum heating installations. The regulation is self-indicated on the dial, from shut to full open. It is all-metal construction, packless and leakage is impossible, there being no packing boxes. Multiflex bellows replace all packing. One-half turn of the lever closes the valve tightly. This valve is a steam and water tight valve, with valve lift obtained by ½ turn, graduated into open, ¾ open, ½ open, ¼ open and shut.



Exterior



Interior

The merits of this valve are tabulated as follows:

1. All-metal construction, handsomely finished in full nickel.
2. Moving parts of special wear-resisting metal.
3. ½ turn of handle opens full from shut to full opening, modulation correct.
4. Large steam port, renewable Jenkins disk, full lift.
5. Packless, multiflex bellows insures a stream and water tight valve.
6. Extra heavy swivel and nut.
7. All parts interchangeable.

Sizes, patterns and weights of the B&B Line of Multiflex Modulation Valves are as follows:

| Size Inches | Pattern | Serial No. | Weight, Lbs. |
|---|---|---|---|
| ½ | Angle | 6335 | 2 |
| ¾ | Angle | 6345 | 2½ |
| 1 | Angle | 6355 | 3 |
| 1¼ | Angle | 6365 | 6 |
| 1½ | Angle | 6435 | 7 |
| 2 | Angle | 6445 | |

| | | |
|---|---|---|
| ½ | S. W. | 6685 |
| | R. H. | 6695 |
| | L. H. | 6705 |
| ¾ | S. W. | 6715 |
| | R. H. | 6725 |
| | L. H. | 6735 |
| 1 | S. W. | 6745 |
| | R. H. | 6755 |
| | L. H. | 6765 |
| 1¼ | S. W. | 6775 |
| | R. H. | 6785 |
| | L. H. | 6795 |

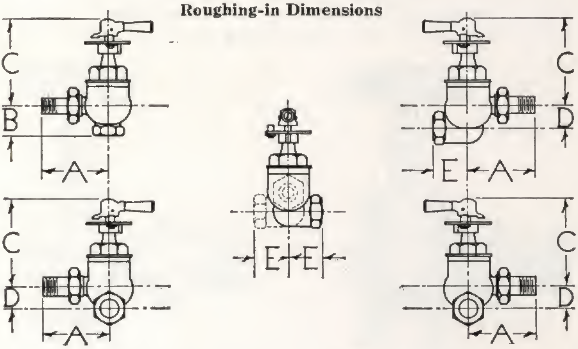
# The B&B Line of Modulation Valves

## Specifications, Roughing-in and Performance Data

1. Body and bonnet of the best steam brass, fully nickeled.
2. Valve stem, stem guide and disc holder of the best steam brass, accurately machined.
3. Diaphragm, heavy B&B Multiflex Bellows of special composition brass.
4. Disc holder contains, renewable Jenkins disc.
5. Handle, index plate, hub pin and stop screw accurately machined and nickeled.
6. Swivel and nut extra heavy brass, nickeled finished.

All parts are interchangeable, and the trimmings of the valve full nickeled polished. This is a handsome and efficient Modulation Valve.

**Roughing-in Dimensions**



| Size | A | B | C | D | E |
|---|---|---|---|---|---|
| ½" | 2⅞" | 1 7/16" | 4 | ¾" | 1½" |
| ¾" | 3⅜" | 1½" | 4 | 1 " | 1¾" |
| 1 " | 3¾" | 1⅝" | 4 | 1¼" | 2 " |
| 1¼" | 4 " | 2⅛" | 4 | 1¼" | 2¼" |
| 1½" | | | | | |

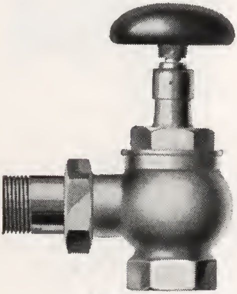
The Performance and capacity of the B&B Line of Modulation Valves on different service are as follows:

| Size | Direct Radiation | |
|---|---|---|
| In. | Vacu Vapor | Return Line |
| ½ | 0 to 20 | 0 to 25 |
| ¾ | 21– 60 | 26– 75 |
| 1 | 61–120 | 76–150 |
| 1¼ | 121–200 | 151–300 |
| 1½ | 201–350 | 301–500 |
| 2 | 351–450 | 501–650 |

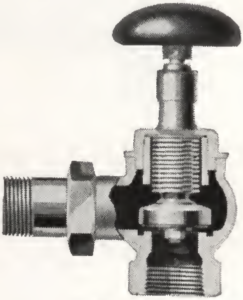
# The B&B Line of Multiflex Radiator Valves

## Full Opening Type

The B&B Line of full opening valves is standard equipment for vapor, vacuum, one and two pipe steam, and for hot water installations. The valve is an all-metal packless type, durably constructed out of the best steam brass, fully nickeled and adjusted, and tested at the factory. The valve contains one Multiflex Bellows Diaphragm surrounding the valve stem. Steam, water and air-tight valve and without the use of gaskets, packing or stuffing boxes. Jenkins discs are used. This type furnished with wood handles, less than two turns of which opens full or closes tight the valve on its seat. All operating parts are not in direct contact with steam or water. The B&B Line of Full Opening Valves is a tried and proven one, hundreds of thousands of these valves being in use in all parts of the country.



Exterior



Interior

Sizes, patterns, serial numbers and weights of the B&B Line of Multiflex Full Opening Valves are as follows:

| Size Inches | Pattern | Serial Number | Weight Lbs. |
|---|---|---|---|
| ½ | Angle | 5415 | 2 |
| ½ | S. W. | 5505 | 2 |
| ½ | R. H. | 5515 | 2 |
| ½ | L. H. | 5525 | 2 |
| ¾ | Angle | 5185 | 2½ |
| ¾ | S. W. | 5535 | 2½ |
| ¾ | R. H. | 5545 | 2½ |
| ¾ | L. H. | 5555 | 2½ |
| 1 | Angle | 5425 | 3 |
| 1 | S. W. | 5565 | 3 |
| 1 | R. H. | 5575 | 3 |
| 1 | L. H. | 5585 | 3 |
| 1¼ | Angle | 5435 | 6 |
| 1¼ | S. W. | 5595 | 6 |
| 1¼ | R. H. | 5605 | 6 |
| 1¼ | L. H. | 5615 | 6 |
| 1½ | Angle | 5975 | 7 |
| 2 | Angle | 5985 | 10 |

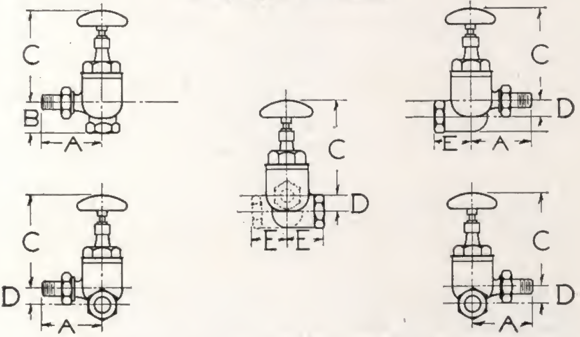
# The B&B Line of Full Opening Valves

## Specifications, Roughing-in and Performance Data

1. Body, bonnet of the best steam brass, fully nickeled.
2. Valve stem, valve stem guide and disc holder of best steam brass, accurately machined.
3. Diaphragm, heavy B&B Multiflex Bellows of special composition brass.
4. Valve, Jenkins disc, held in disc holder.
5. Handle, hub and pin accurately machined and fitted, finished black.
6. Swivel and nut, extra heavy, finished in nickel.
7. For pressures up to 25 pounds.

All parts interchangeable, the valve being factory tested and adjusted.

**Roughing-in Dimensions**



| Size | A | B | C | D | E |
|---|---|---|---|---|---|
| ½" | 2⅞" | 1 7/16" | 4¾" | ¾" | 1½" |
| ¾" | 3⅜" | 1½" | 4¾" | 1" | 1¾" |
| 1" | 3¾" | 1⅝" | 4¾" | 1¼" | 2" |
| 1¼" | 4" | 2⅛" | 4¾" | 1¼" | 2¼" |

The performance and capacity of the B&B Line of Full Opening Valves on the different heating systems on which it may be used are as follows:

Square Feet of Radiation

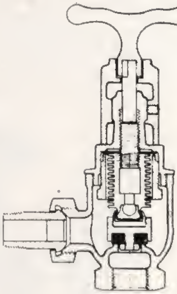
| Size In. | Vacu Vapor | Return Line | One Pipe | Hot Water |
|---|---|---|---|---|
| ½ | 0 to 20 | 0 to 25 | | |
| ¾ | 21– 60 | 26– 75 | | 0 to 21 |
| 1 | 61–121 | 76–150 | 0–30 | 21– 55 |
| 1¼ | 121–200 | 151–300 | 31– 60 | 56–150 |
| 1½ | 201–350 | 301–500 | 61– 80 | 151–225 |
| 2 | 351–450 | 501–650 | 81–130 | 226– |

Made in the following patterns: Angle, straightway, right and left hand.

# The B&B Line of Extended and Lock Shield Type of Valves

The B&B Line of Valves are furnished on orders specifying them with lock and shield, extension stem or with wheel and chain. These attachments may be applied to either the B&B Line of Full Opening Steam and Hot Water Valves, or to the B&B Line of Modulation Valves.

The lock and shield type is illustrated in the following cut.



Lock and Shield

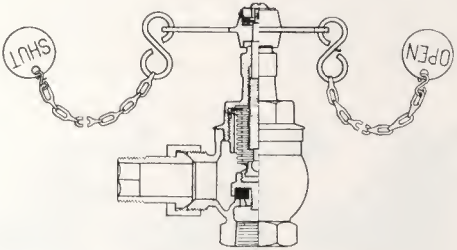
Serial numbers for the various patterns of the B&B Line of Full Opening and Modulation Valves are as follows: For 1, Lock and shield attachment; 2, Wheel and chain attachment, and 3, for extension stem type.

| Size Inches | Pattern | No. 1 Lock and Shield | No. 2 Chain Pull | No. 3 Extension Stem Straight Handle |
|---|---|---|---|---|
| ½ | Angle | 6375 | 7305 | 7345 |
| ½ | S.W. | 6805 | 7645 | 7525 |
| ½ | R.H. | 6815 | 7655 | 7535 |
| ½ | L.H. | 6825 | 7665 | 7545 |
| ¾ | Angle | 6385 | 7315 | 7355 |
| ¾ | S.W. | 6835 | 7675 | 7555 |
| ¾ | R.H. | 6845 | 7685 | 7565 |
| ¾ | L.H. | 6855 | 7695 | 7575 |
| 1 | Angle | 6395 | 7325 | 7365 |
| 1 | S.W. | 6865 | 7705 | 7585 |
| 1 | R.H. | 6875 | 7715 | 7595 |
| 1 | L.H. | 6885 | 7725 | 7605 |
| 1¼ | Angle | 6405 | 7335 | 7375 |
| 1¼ | S.W. | 6895 | 7735 | 7615 |
| 1¼ | R.H. | 6905 | 7745 | 7625 |
| 1¼ | L.H. | 6915 | 7755 | 7635 |
| 1½ | Angle | 6415 | | |
| 2 | Angle | 6425 | | |

# The B&B Line of Extended and Lock Shield Type of Valves

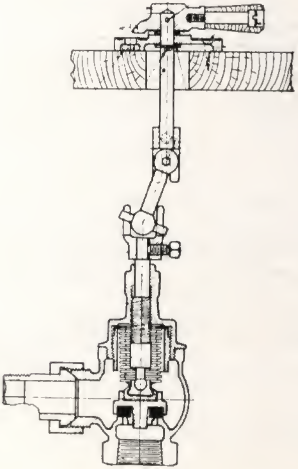
The wheel and chain type of stem fitting is illustrated in the following cut. This attachment permits of shutting off or turning-on of valves located at what would ordinarily be inaccessible places.

Chain Pull Type

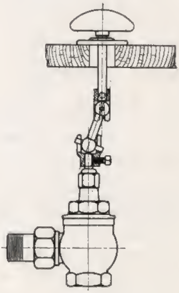


The extension stem type of stem fitting illustrated, permits of turning on or off concealed radiators, heating coils, etc. It is furnished in two styles of handles, straight and similar to those on modulation valves, or round, similar to the ordinary type of radiator valve wheel.

Straight Handle Type

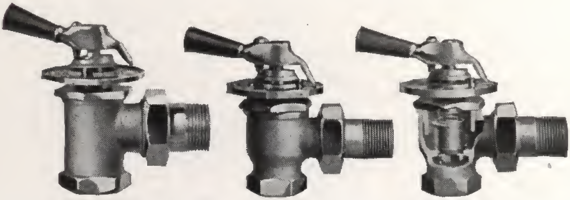


Wheel Handle Type



# The B&B Line of Thermograde Modulation Valves

The B&B Thermograde Modulation Valve is a graduate, packless one-turn full open or closed, radiator supply valve. These valves are adapted to supply steam to radiators in connection with vapor, vacuum heating systems. There are no stuffing boxes to leak, and no repacking is required at any time, and this valve may be adjusted on the job and set to meet all working conditions. The B&B Thermograde Modulation Valve may be closed to its seat and thus be tight under all ordinary conditions.



The sizes, serial number and weights of this B&B Line are as follows:

| Size Inches | Serial Number | Weight Lbs. |
|---|---|---|
| ½ | 2505 | 1½ |
| ¾ | 2515 | 1½ |
| 1 | 2525 | 1¾ |
| 1¼ | 2535 | 2½ |
| 1½ | 2545 | 3 |

The merits of this valve are tabulated as follows:

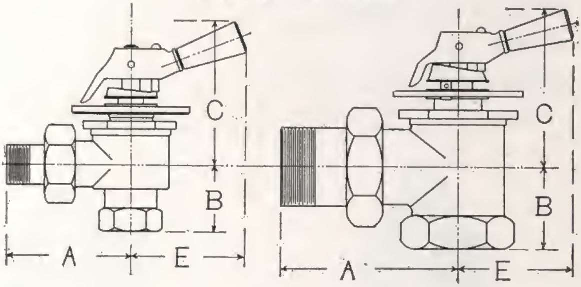
1. All-metal construction, moving parts of wear-resisting material.
2. One turn of the handle fully opens or shuts the valve.
3. The valve can be adjusted on the job and set to working conditions.
4. Metal valve on metal seat, of the best steam metal.
5. Packless, machined and fitted to perfect tightness.
6. Can be closed onto the seat, so as to be perfectly tight under all conditions.
7. Regulation, self indicating on the dial, to shut, ¼", ½", ¾" and full opening.
8. Parts interchangeable.
9. Has extra heavy swivel and nut, nickel finished.

# The B&B Line of Thermograde Modulation Valves

## Specifications, Roughing-in and Performance Data

1. Body, cap and dial, best steam brass, accurately machined and full nickel finish.
2. Indicator dial, etched metal, indicator handle, wood, highly polished, black.
3. Indicator screw, adjusting and lock screw, accurately machined and high finish.
4. Valve stem and locking device of the best steam brass, accurately machined.
5. All parts interchangeable.
6. Swivel and nut, solid brass, accurately machined, full nickel finish.

### Roughing-in Dimensions



| | Size | A | B | C | E |
|---|---|---|---|---|---|
| | ½″ | 2 11/16″ | 1 7/16″ | 2 15/16″ | 2 ⅜″ |
| | ¾″ | 3″ | 1 ⅜″ | 3″ | 2 ⅜″ |
| * | 1″ | 2 15/16″ | 1 9/16″ | 3 3/16″ | 2 ⅜″ |
| * | 1 ¼″ | 3 11/16″ | 1 ¾″ | 3 ¼″ | 2 ⅜″ |
| * | 1 ½″ | 4 ⅜″ | 2 3/16″ | 3 ⅞″ | 2 ⅜″ |

The performance and capacity of the B&B Thermograde Modulation Valve is, as follows:

| Size Inches | Serial Number | Capacity | |
|---|---|---|---|
| | | Sq. Ft. Vapor | Radiation Vacuum |
| ½ | 2505 | 0–20 | 0–35 |
| ¾ | 2515 | 21–60 | 36–75 |
| 1 | 2525 | 61–120 | 76–150 |
| 1 ¼ | 2535 | 121–200 | 151–300 |
| 1 ½ | 2545 | 300 | 450 |

# The B&B Line of Thermograde Auto Valves

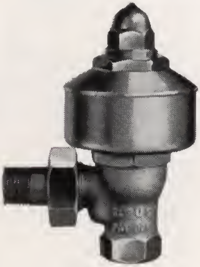
The B&B Line of Thermograde Auto Valves is a line of thermostatic return valves which allow the passage of air and water of condensation, automatically and noiselessly, without escape of steam, into the return piping.

It is used in connections with vapor and vacuum systems of steam circulation on the return ends of radiators, coils, drip points, and blast coils for draining without steam loss.

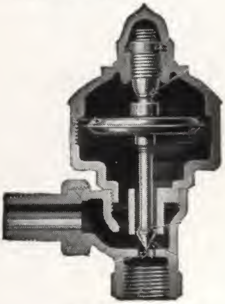
The Thermograde Auto Valve or Trap is supplied in three sizes ½″, ¾″ and 1″ and in two types of bodies, full brass and cast iron. All types are fitted with hand-spun phosphor bronze thermal members, accurately tested individually, and filled with a volatile liquid, hermetically sealed under twenty-two-inch vacuum. Steam in contact with the thermal member vaporizes the volatile liquid, in turn expands and closes the trap, preventing escape of steam: air and water of condensation cools the thermal member, and the trap opens, permitting both air and water of condensation to pass, and again closes. Thorough drainage and air elimination are assured with positively the highest efficiency.

The ½″ size is furnished in brass body only, the ¾″ in brass or cast iron and the 1″ in iron body only.

**The Brass Body Type of Thermograde Traps**



Exterior



Interior

The sizes, patterns, serial number and weights of the Brass Body Type are as follows:

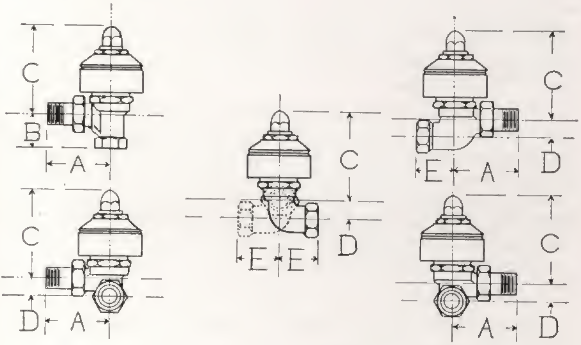
| Size Inches | Type | Serial | Net Weight |
|---|---|---|---|
| ½ | Angle | 2965 | 2 |
| ½ | SW. | 2975 | 2 |
| ½ | Right | 2985 | 2 |
| ½ | Left | 2995 | 2 |
| ¾ | Angle | 3005 | 3 |
| ¾ | SW. | 3015 | 3 |
| ¾ | Right | 3025 | 3 |
| ¾ | Left | 3035 | 3 |

# The B&B Line of Thermograde Auto Valves
## Brass Body Type

### Specifications, Roughing-in and Performance Data

1. Body, cover, pot and cover nut of steam brass, nickel finish.
2. Valve and seat, conical valve and sharp edge seat renewable.
3. Thermal member diaphragm of heavy hand spun phosphor bronze containing volatile liquid.
4. Valve stem, extra long, attached to thermal member on lower side.
5. Swivel and nut, solid brass, accurately machined, nickel finish.

This is an EXTERNAL adjusting trap, no disconnections of any kind are required to make any desired adjustments for full seating of valve on its seat, or to blow through for cleaning out. Steam does not have to be turned off to adjust, but as a very slight turning of the screw will have a pronounced effect, caution is indicated. Remove the cover nut, with a screw driver turn to right if closer seating is required, and to left if too close. It is advisable to do this without releasing lock washer if the adjustment required is small. If adjustment required is great, release lock washer, screw down when cold to full seating, then run down the lock washer. Replace the cover nut after any adjusting.



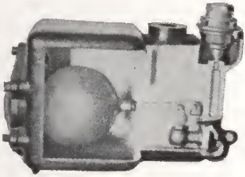
| SIZE | A | B | C | D | E |
|---|---|---|---|---|---|
| 1/2" | 2 5/8" | 1 9/16" | 3 3/4" | 3/4" | 1 1/4" |
| 3/4" | 3" | 1 5/8" | 4 1/8" | 1" | 1 1/4" |

Performance: The B&B Line of Thermograde Auto Valves is external adjustment traps, and have the following capacities based on square feet of direct radiation.

| Size | Vapor | Vacuum |
|---|---|---|
| 1/2" | 0 to 125 | 0 to 150 |
| 3/4" | 126 to 400 | 151 to 500 |

# The B&B Line of Blast Traps

The B&B Blast Trap is used to handle large and variable quantities of condensation quickly and efficiently. It is of service in draining hot blast coils, dripping large mains, for draining hot water generators and similar apparatus. It can be used in connection with any return line vacuum system of steam circulation.



A combination of inlets and outlets is possible with this trap, but for standardized work the following is tabulated. In this tabulation special sizes of inlets are listed, which can be furnished if required.

This trap is a combination thermostatic and float trap. The air is handled by the thermostatic member, the water by the float member. It positively cannot become air bound. For heavy duty this trap is a necessity.

In all heating apparatus and drying apparatus subjected to a blast of air, or to a current of air drawn over the heating surface, conditions may vary over a wide range due to damper regulation, speed of fans, outside temperatures and other factors. The trap which handles condensation and air from such apparatus must be one capable of handling widely varying quantities of both air and water, and must in turn be one which does not pass steam. The B&B Blast Trap is designed for exactly this service.

Operates on pressures up to 15 pounds.

Sizes, serial numbers, tappings and weights of the B&B Line of Blast Traps are as follows:

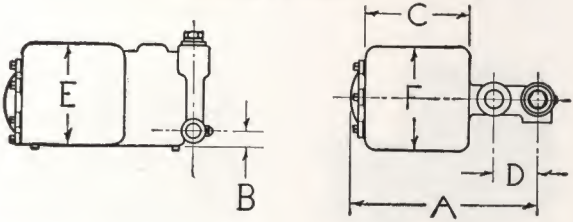
| Trap No. | Serial No. | Inlet Reg. | Inlet Spec. | Outlet | Diameter of Valve | Weight Lbs. |
|---|---|---|---|---|---|---|
| 1 | 2935 | 1 | 1¼ | ¾ | ½ | 60 |
| 2 | 2945 | 1¼ | 1½ | 1 | ⅝ | 60 |
| 3 | 2955 | 1½ | 2 | 1¼ | ⅝ | 65 |
| 4 | 4665 | 1½ | 2 | 1½ | ⅞ | 105 |
| 5 | 4675 | 2 | 2½ | 1½ | 1 | 105 |

# The B&B Line of Blast Traps

## Specifications, Roughing-in and Performance Data

1. Body and cover of fine grained cast iron. Cover fastened to body by six cap screws and asbestos graphited gasket used.
2. Valve, valve body, cover nut and link, of the best steam brass, especially selected for this service.
3. Float of seamless copper, tested at high pressure. Float connection, connection screw and extension interchangeable.
4. Air valve thermostatic element of the Multiflex bellows same design as used in the Multiflex Trap.

**Roughing-in Dimensions**



| Size | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | 13" | 1½" | 6¾" | 3¼" | 8½" | 6¾" |
| 2 | 14" | 1½" | 7¼" | 3½" | 8½" | 6¾" |
| 3 | 15" | 1½" | 7¾" | 3¾" | 8½" | 6¾" |
| 4 | 16" | 1½" | 9" | 3¾" | 8½" | 9" |
| 5 | 18" | 1½" | 10" | 4" | 8½" | 10" |

Performance: The B&B Line of Blast Traps has the following capacities:

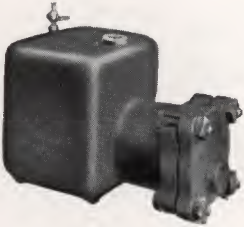
| Trap No. | Capacity Sq. Ft. of Radiation | Lineal Feet of one inch pipe |
|---|---|---|
| 1 | 3000 | 9000 |
| 2 | 6000 | 18000 |
| 3 | 9000 | 27000 |
| 4 | 12000 | 36000 |
| 5 | 15000 | 45000 |

# The B&B Line of Low Pressure Traps

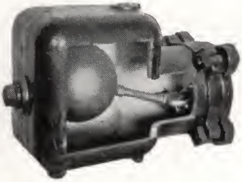
## Coenco Type

The B&B Line of Low Pressure Traps are steam traps of the Coenco type for handling large quantities of water without the escape of steam The valve is of the piston type operated by a float. The valve opens when the water reaches a predetermined level, discharging air and water of condensation into the return. This trap assures against steam loss when condensation is not present. The trap operates on pressures up to 30 pounds and discharges against a head of water approximately 2 feet for each pound of pressure.

The valve opening is large, all working parts are attached to the head, and access to these parts is very easy.



Exterior



Interior

The B&B Line of Low Pressure Traps automatically and continuously drain all condensation from apparatus using steam up to 30 pounds pressure. Valve and seat are designed for low pressure work, assuring the trap to be continuous in its discharge. This trap will not discharge water back to a boiler. For pressure under 15 pounds the B&B Line of Multiflex Traps are recommended, in place of this type.

The sizes, serial numbers, tappings and weight of the B&B Line of Low Pressure Traps are as follows:

| No. | Serial | Tappings Inches | Weight Lbs. |
|---|---|---|---|
| 1 | 3825 | ¾x¾ | 45 |
| 2 | 3835 | 1 x1 | 53 |
| 3 | 3845 | 1¼x1¼ | 56 |
| 4 | 3855 | 1½x1½ | 86 |
| 5 | 3865 | 2 x2 | 103 |

# The B&B Line of Low Pressure Traps

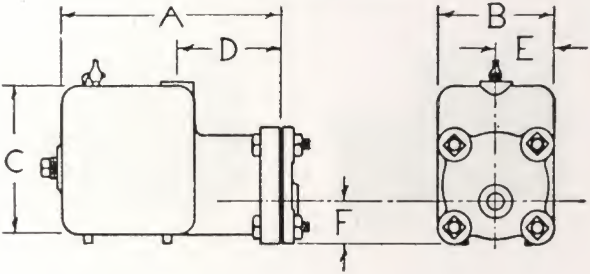
## Coenco Type

## Specifications, Roughing-in and Performance Data

1. Body and cover of heavy iron castings. Cover fastened to body by four suitable bolts.
2. Gasket, graphited asbestos.
3. Valve, piston type, securely fastened to float. Valve opening larger than inlet pipe.
4. Float ball, of seamless copper tested to high pressure.
5. Float lever securely fastened to ball and valve lifting arm.
6. Vent cock and clean-out plug provided.

The best steam brass is used in the valve proper, of a grade that we have found to be highly resistent to the cutting action of water.

**Roughing-in Measurements**



| Size | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | 12¼″ | 7″ | 9″ | 5¾″ | 3½″ | 2½″ |
| 2 | 13″ | 7″ | 9¾″ | 6″ | 3½″ | 2½″ |
| 3 | 14″ | 7″ | 10½″ | 6¼″ | 3½″ | 2½″ |
| 4 | 15⅛″ | 9¼″ | 11″ | 6½″ | 4⅝″ | 2⅝″ |
| 5 | 15⅞″ | 9¼″ | 11¾″ | 6¾″ | 4⅝″ | 2⅝″ |

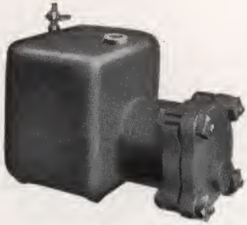
Performance: The attached tables figured from actual working tests indicate the use of the B&B Line of Low Pressure Traps.

| Size | Inlet /Outlet Inches | Will Drain: Lineal Feet of 1″ Pipe | Square Feet of Radiating Surface |
|---|---|---|---|
| No. 1 | ¾ | 6480 | 2160 |
| No. 2 | 1 | 10080 | 3360 |
| No. 3 | 1¼ | 14400 | 4800 |
| No. 4 | 1½ | 19800 | 6600 |
| No. 5 | 2 | 25920 | 8640 |

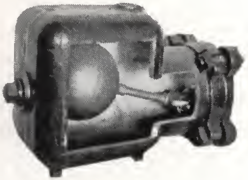
# The B&B Line of High Pressure Steam Traps

## Coenco Type

The B&B Line of Steam Traps for high pressure is of the Coenco type, the valve being of the Corliss type, operated by a seamless copper float. The float causes the valve to open when the water rises and cuts off the discharge when the water level falls to a predetermined point. It is a perfectly balanced valve and gives perfect satisfaction under all conditions, and is unaffected by wear. The float and valve are rigidly connected, lost motion is eliminated, and the valve cannot be thrown out of line with the seat. All working parts are attached to the head and can be removed with it.



Exterior



Interior

The B&B High Pressure Steam Trap, for pressures up to 100 pounds will lift condensation to a high level, there being 2 feet in height allowance for each pound difference of pressure between inlet and outlet. The ratings of this trap are based on actual test under working conditions, and proper provisions are made for the heavy condensation that takes place in some types of steam equipment when the steam is first turned on.

This trap will not discharge water back to the boiler.

The sizes, serial numbers, tappings and weight of the B&B Line of High Pressure Traps are as follows:

| No. | Serial | Tappings Inches | Weight Lbs. |
|---|---|---|---|
| 1 | 2385 | ¾x ¾ | 45 |
| 2 | 2735 | 1 x1 | 53 |
| 3 | 2745 | 1¼x1¼ | 56 |
| 4 | 4025 | 1½x1½ | 86 |
| 5 | 4035 | 2 x2 | 103 |

# The B&B Line of High Pressure Traps

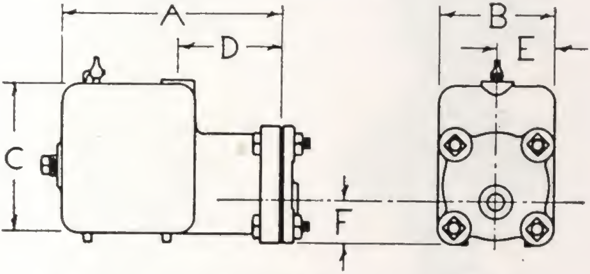
## Specifications, Roughing-in and Performance Data

1. Body and cap of heavy iron castings. Cap fastened to body by four suitable bolts.
2. Gasket, graphited asbestos.
3. Valve body, key and yoke of the best steam brass, accurately fitted and tested at the factory. Attached to the head and removable with it. A Corliss Valve.
4. Float ball, of seamless copper tested to 150 pounds pressure.
5. Float lever securely fastened to ball and to valve actuating lever.
6. Vent cock and clean-out plug accurately fitted.

The composition used in the valve proper is extremely hard metal and will resist the cutting action of water many times longer than will ordinary steam metal.

The B&B High Pressure Trap will discharge 2 feet in height for every pound pressure under which it is operating, or against any lower pressure. It will not return the water of condensation to the boiler.

**Roughing-in Dimensions**



| Size | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | 12¼" | 7" | 9" | 5¼" | 3½" | 2½" |
| 2 | 13" | 7" | 9¼" | 6" | 3½" | 2½" |
| 3 | 14" | 7" | 10½" | 6¼" | 3½" | 2½" |
| 4 | 15⅛" | 9¼" | 11" | 6½" | 4⅝" | 2⅝" |
| 5 | 15⅞" | 9¼" | 11¾" | 6¾" | 4⅝" | 2⅝" |

Performance: The attached table figured from actual working tests indicates the use of the B&B Line of High Pressure Traps.

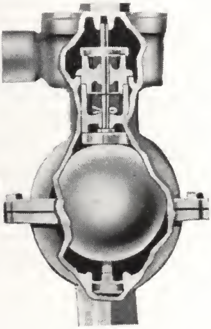
| Size | Inlet–Outlet Inches | Will Drain: Lineal Feet of 1" Pipe | Square Feet of Radiating Surface |
|---|---|---|---|
| 1 | ¾ | 3000 | 1000 |
| 2 | 1 | 6500 | 2175 |
| 3 | 1¼ | 15000 | 5000 |
| 4 | 1½ | 20000 | 6675 |
| 5 | 2 | 30000 | 10000 |

# The B&B Line of 4-V Vent Valves

The B&B 4-V Vent Valve is a device designed to prevent a steam heating system from becoming air bound. It is for use in air line systems or in vacu-vapor systems.

It allows air to escape from a heating system and prevents its return, and is a quick venting device. Water of condensation accumulating in the valve, raises the float in the bottom half of the device, preventing the escape of water. It should be placed on the top of the dry return at its lowest point, but should never be installed at less than 30 inches above the water line of the boiler.

Exterior



Interior

The B&B 4-V Vent Valve is furnished in but one size, namely 1", of weight and serial number as follows:

| Size Inches | Serial Number | Net Weight Lbs. |
|---|---|---|
| 1 | 935 | 12½ |

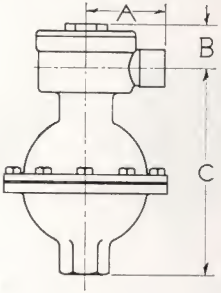
The 4-V Vent Valve is substantially made, the body of heavy iron casting, the air and water valve being solid bronze, the ball being of composition and unaffected by hot condensation. With this device no stand pipe or overflow commonly used on vapor systems is necessary.

# The B&B Line of 4-V Vent Valves

## Specifications, Roughing-in and Performance Data

1. Body, heavy fine grained grey cast iron.
2. Air and water valve accurately machined from solid selected bronze.
3. Valve seat, composition suitable for the service designed for.
4. Float ball of composition that is not affected by hot condensation.
5. The valve contains no complicated parts, and requires no attention after installing, adjusting being made at the factory.

**Roughing-in Dimensions**



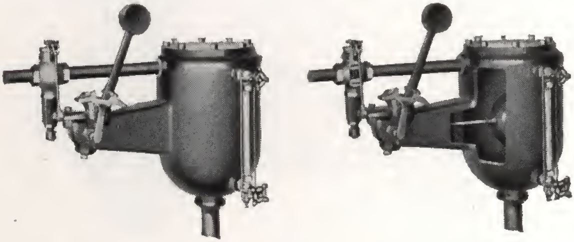
| Size | A | B | C |
|---|---|---|---|
| 1" | 3⅜" | 1⅝" | 8½" |

Performance: The B&B 4-V Vent Valve is used in connection with vapor systems not exceeding 2500 square feet of direct radiation. Piping arrangements sometimes require two or more vent valves. It is also used on air line systems not exceeding 800 square feet of direct radiation. On systems having a vacuum pump, it may be used for the purpose of relieving air from the systems when the vacuum pump is shut down and the by-pass open to the boiler.

# The B&B Line of Alternating Receivers

The B&B Alternating Receiver is a device which automatically returns water to the boiler. They are for use on vapor system of steam circulation. On such installations the returns are open to atmospheric pressure, and when pressures build up on the supply side, condensation backs up in the return line until a head is formed sufficient to overcome boiler pressure. Because of this occurrence, air binding is common, and to overcome this defect the B&B Alternating Receiver has been designed.

The condensation rises in the receiver until the discharge lever is reached, the float rises and opens valve, and the pressure between receiver and boiler is equalized and the water returns to the boiler. The B&B Alternating Receiver should be installed above the water line of the boiler and never less than six inches above. Condensation will not collect in return mains regardless of boiler pressure, be it 2 pounds or 10, when a B&B Alternating Receiver is used.



Note: The Gauge Glass Illustrated is not considered standard equipment; if wanted must be specified extra.

The sizes, serial numbers and weights of the B&B Line of Alternating Receivers are as follows:

| Size | Serial No. | Size | Steam Connections Inches | Weight Lbs. |
|---|---|---|---|---|
| No. 1 | 3065 | | 1 | 180 |
| No. 2 | 5125 | 20″x24″ | 1 | 270 |
| No. 3 | 5405 | 24″x30″ | 1½ | |
| No. 4 | 5655 | 24″x36″ | 1½ | |

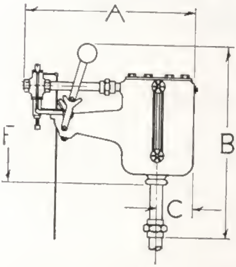
The B&B Alternating Receiver requires no additional head room for its installation. It is simple, fool proof, positive and noiseless in operation.

# The B&B Line of Alternating Receivers

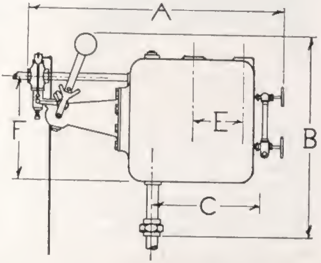
## Specifications, Roughing-in and Performance Data

1. Body of best fine grained grey cast iron for sizes 1 and 2, accurately machined.
2. Body of steel plate accurately rolled with all joints welded. For Nos. 3 and 4.
3. Cover of fine grained grey cast iron accurately machined.
4. Seamless copper float securely fastened to trip lever arms.
5. Actuating lever with weight and trip pins cast in one piece, from grey cast iron.
6. Operating levers of the best brass, accurately machined and fitted.
7. Equalizing valve of the best steam brass, accurately machined, fitted and adjusted.
8. Valve seat, stem and valve proper of the best steam brass accurately machined.
9. Entire assembly thoroughly inspected and factory tested.
10. Gauge glass ½″, 10 inches on sizes 1 and 2, 6″ on larger sizes, of standard quality as required by the B&B Line.
11. Screws, gaskets, stuffing boxes to the high standard of quality required by the B&B Line.

### Roughing-in Dimensions



No. 1



Nos. 2, 3 and 4

| Size | A | B | C | E | F |
|---|---|---|---|---|---|
| No. 1 | 27″ | 23″ | 5½″ | ---- | 15¾″ |
| No. 2 | 34″ | 26″ | 11½″ | 9″ | 19¼″ |
| No. 3 | 40″ | 28″ | 21½″ | 7″ | 21½″ |
| No. 4 | 49″ | 29″ | 27½″ | 11″ | 22 ″ |

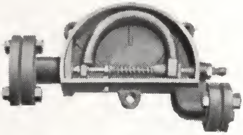
Performance: The B&B Alternating Receiver when connected to return mains as shown in typical drawings, will return all the water of condensation to the boiler without a pump, and effectively prevent air binding of low pressure vapor systems of steam heating. The capacity of the several sizes, based on square feet of direct radiation, is as follows:

| Number | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Capacity | 6000 | 10000 | 15000 | 18000 |

# The B&B Line of Marck Steam Traps

The B&B Line of Marck Steam Traps is for use on medium steam pressures, to automatically permit the passage of air and condensation, and to prevent passage of steam. It is an automatic valve, working on the thermostatic principal, does not exert force of any kind and will not return water to a boiler. It is always closed at temperatures above 212 and always open at below 212 degrees Fahrenheit. It is a valve that closes against the pressure. Air, water and dirt are blown through the trap by the pressure of the steam behind them, but as soon as steam reaches the trap, the tube spring acts by expanding and closes the valve. All parts of the Marck Steam Traps are interchangeable, 3 nuts permit access to the interior. As action takes place through temperature of the tube, the trap should not be installed directly over live steam pipes, boilers, etc., for in such cases the trap will not open.

Exterior



Interior

The B&B Line of Marck Steam Traps is used to drain whistles, sirens, steering engines, winches on vessels; to drain steam cooking apparatus in hotels and restaurants; to drain numerous heating and drying apparatus used in textile mills, cotton mills, woolen mills, bleacheries, paper mills, brick plants, lumber driers, laundries, greenhouses, candy factories, soap plants, and other industrial establishments where medium pressure steam is used.

The B&B Line of Marck Steam Traps is notable because of simplicity of construction and efficiency in operation, ease of access for cleaning, interchangeability of parts, large capacity and extra large valve openings. The capacity of this type of trap is equal to the capacity of the smallest pipe leading to or from it, hence this should be remembered in selecting size desired. A trap of this type blowing condensation continuously indicates a too small size. It is better as a rule to have a trap a little larger than necessary rather than one that is too small. It operates on pressure up to 50 pounds.

Sizes, serial numbers and weights of the B&B Line of Marck Steam Traps are as follows:

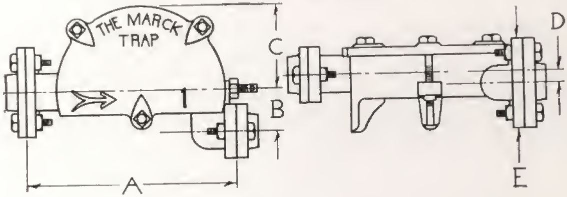
| Size and Number In. | Serial No. | Weight Lbs. |
|---|---|---|
| ¼ No. 00 | 1925 | |
| ⅜ No. 0 | 1935 | 6⅛ |
| ½ No. 1 | 1945 | 11 |
| ¾ No. 2 | 1955 | 13⅛ |
| 1 No. 3 | 1965 | 20 |
| 1¼ No. 4 | 1975 | 21⅛ |

# The B&B Line of Marck Steam Traps

## Specification, Roughing-in and Performance Data

1. Case and cover, selected cast iron, cover bolted on with 3 clips as illustrated.
2. Tube spring shown of selected material, hollow, bent crescent shape, and capable of standing high pressure, filled with liquid which at 212 degrees expands and closes the valve.
3. Valve seat made of composition selected for wearing qualities.
4. Valve stem guide supports and guides valve.
5. Brass spring holds the tube in position against the adjusting spring and prevents expansion in any other direction than against seat. This spring has no effect on the valve opening, which is controlled by tube spring.
6. Adjusting screw moves tube spring forward or back as may be required to properly seat the valve.

**Roughing-in Dimensions**



| Size | A | B | C | D | E |
|---|---|---|---|---|---|
| 0—⅜″ | 6⅝″ | 1¼″ | 2⅞″ | ½″ | 3⅜″ |
| 1—½″ | 8¾″ | 1¾″ | 3½″ | ½″ | 3⅝″ |
| 2—¾″ | 10⅝″ | 1¾″ | 4″ | ½″ | 3⅞″ |
| 3—1″ | 13″ | 2″ | 5″ | ½″ | 4″ |
| 4—1¼″ | 14¼″ | 2″ | 5″ | ½″ | 4⅜″ |

This trap will not discharge against pressure, hence must be placed at the lowest point to be drained. It can be placed vertically, horizontally or flat, but the curve of the body MUST NEVER BE DOWN, as condensation would pocket in this position. Connections should be made to INLET, the arrow on the case shows direction of flow.

**Capacities in Square Feet of 1″ Pipe**

| Size and Number In. | Size of Pipe Connection Inches | Capacity in Sq. Ft. of 1″ Pipe |
|---|---|---|
| ⅜ No. 0 | ⅜ | 225 to 900 |
| ½ No. 1 | ½ | 450 to 2,700 |
| ¾ No. 2 | ¾ | 900 to 5,850 |
| 1 No. 3 | 1 | 1,800 to 6,750 |
| 1¼ No. 4 | 1¼ | 2,250 to 10,800 |

# The B&B Line of Separators

## The B&B Oil & Steam Separators

The B&B Line of Steam Separators separates the moisture and slugs of water from live steam, insuring higher efficiency in engine and high pressure heating apparatus.

They are designed for service where it is desirable or necessary to remove any liquid or solid substances, such as water, oil, grit, dirt and scale, from any gaseous currents or steam.

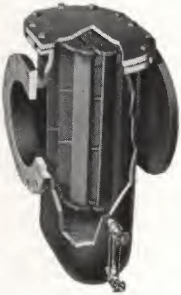
The B&B Line of Oil and Steam Separators is made in sizes from 2″ to 12″, and for use on gravity or vacuum systems of heating.

The steam carrying moisture, oil or dirt passes through a series of baffles in the B&B Separator, the drops of liquid collecting on the surface of the baffles, and dropping into the reservoir of the separator. The baffles are designed so that liquids collected are not in contact with flowing GASES, after collection by the plates, hence are not retaken up, and the oil reservoir is so located that liquids collected cannot be picked up by the steam current again.

Oil separators in particular will tend to collect dirt, in fact any separator on steam, air or other gas will collect more or less oil, hence dirt, and thus baffles will become dirty. The baffle plates are easily removable for cleaning without disturbing pipe connections, the top cap of the separator being easily taken off. Oil Separators should be dripped through a B&B Oil Trap. Steam Separators should be dripped through a B&B High Pressure Steam Trap.

Standard equipment does not include companion flanges or gauge glass, and if desired, they must be specified.

Exterior



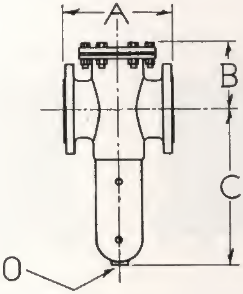
Interior

# The B&B Line of Oil and Steam Separators

## Specifications, Roughing-in and Performance Data

1. Body and cover made of fine grained grey cast iron, accurately machined.
2. Baffle plates of special grey cast iron, V-shaped and packed to impinge, but not obstruct flow. Impingement of solids and liquids retains them.
3. Bolts, plugs and gaskets to the high standard of quality required by the B&B Line.
4. Companion flanges furnished when specified only. Flanges of separators drilled to standard bolt circles.
5. Gauge glass furnished when specified. As standard gauge glass connections, drilled and tapped, and properly plugged.
6. Pipe tap connection on bottom of separator drilled and tapped, for connection to the proper type of trap.

**Roughing-in Dimensions**



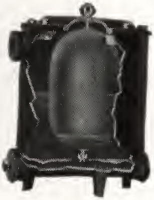
| Size Inlet & Outlet | Serial No. | A Inches | B Inches | C Inches | O Inches | Weight Lbs. |
|---|---|---|---|---|---|---|
| 2 | 4105 | 7¾ | 11 | 11¼ | ¾ | 49 |
| 3 | 4115 | 10 | 12 | 14¾ | ¾ | 87 |
| 4 | 2435 | 12 | 14 | 17¼ | ¾ | 146 |
| 5 | 4095 | 12 | 18 | 16½ | ¾ | 156 |
| 6 | 4185 | 13½ | 19½ | 17¾ | ¾ | 170 |
| 8 | 4135 | 16½ | 24¼ | 19 | ¾ | 221 |
| 10 | 3425 | 17½ | 25½ | 22½ | ¾ | 440 |
| 12 | 3565 | 18 | 33½ | 25 | 1¼ | 500 |

Performance: The B&B Line of Oil and Steam Separators will remove oil and moisture contained in steam, air or other gas or vapor passing through a pipe line in which they are installed efficiently and completely. The moisture content in steam use will be reduced to approximately 1½% after passing through these separators. Dry, oil free steam results, to the limits of mechanical separation. For steam separation the B&B Line of Separators are designed for a steam working pressure of 125 pounds or lower. For extra heavy purposes, these separators are furnished in special designs to meet such conditions, but to similar patterns.

# The B&B Line of Oil Traps

The B&B Oil Trap is used for draining oil separators and exhaust steam mains. The Oil Trap is equipped with a seamless copper float so arranged as to open and close the valve direct, without the use of pivots, levers, or other actuating mechanism. The operation is extremely simple and performance positive. Under suitable and favorable conditions this B&B Oil Trap may be used as a Low Pressure Steam Trap.

Two outlet tappings are provided, either one of which may be used for connection and the unused one plugged. The entire interior can be exposed by removing the cover, and without disturbing pipe connections.



The B&B Oil Trap is offered in one size only, tapped to ¾″ inlet and outlet. The body is large, yielding ample clearance for the float, the float being guided so that it cannot jam. The valve closes smoothly.

When installed the B&B Oil Trap should be provided with a by-pass, and never placed less than 2 feet below the point to be drained. When this trap is used to drain vacuum equipment, a tight swing check valve must be placed on the discharge side of the trap, to prevent entrance of air, at such times as the pressure in low pressure mains is below atmospheric.

The size, serial number and weight of the B&B Line of Oil Traps is as follows:

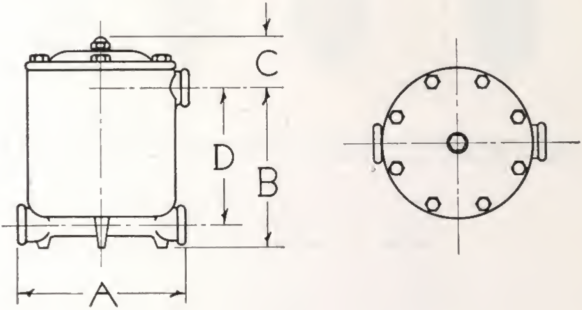
| Size | Serial Number | Net Weight |
|---|---|---|
| ¾″ | 3555 | 40 |

# The B&B Line of Oil Traps

## Specifications, Roughing-in and Performance Data

1. Body, cover and cap, fine grained grey iron castings, accurately machined.
2. Seamless copper float, valve plunger and guide securely fastened to float.
3. Valve seat selected brass, resistant to action of oil, grease and water.
4. Pins, screws and gaskets to B&B high standard of quality.

**Roughing-in Dimensions**



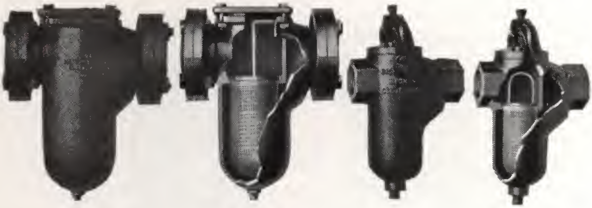
| Size | A | B | C | D |
|---|---|---|---|---|
| ¾″ | 9 | 8⅞ | 2¾ | 7½ |

Pipe Size, ¾″. Allow Head-space of 6″ at C for Cleanout.

Performance:—The use of the B&B Oil Trap is of ample capacity to handle all the drainings from any of the B&B Line of Separators.

# The B&B Line of Dirt and Suction Strainers

Strainers are an important power plant or heating plant consideration, for all fittings no matter how skillfully installed, and especially true of such articles as cast iron radiators, contain sand and dirt in them that may take a long time to work out. Dirt, chips and bits of packing will get into even the best of regulated and operated steam plants, and such materials will cause trouble at various points if not removed. The B&B Line of Suction Strainers are used in steam lines in front of traps, or any automatic device to prevent all foreign matter from entering such devices. On vacuum return lines they are used just ahead of the vacuum pump. They assure of positive continuous service on all apparatus using steam, air or gas, by eliminating trouble makers in the form of dirt and scale.



The sizes, serial numbers and weights of the B&B Line of Dirt and Suction Strainers are as follows:

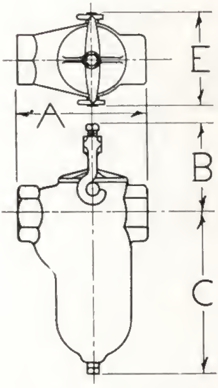
| Size Inches | Serial Number | Weight Lbs. |
|---|---|---|
| ¾x ¾ | 4829 | 4¼ |
| 1 x ½ | 4619A | 4¼ |
| 1 x ¾ | 4619B | 4¼ |
| 1 x1 | 4619 | 4¼ |
| 2 x1¼ | 4629A | 16½ |
| 2 x1½ | 4629B | 16½ |
| 2 x2 | 4629 | 16½ |
| 3 | 4809 | 43 |
| 4 | 4849 | 110 |
| 5 | 4909 | 130 |
| 6 | 4919 | 170 |

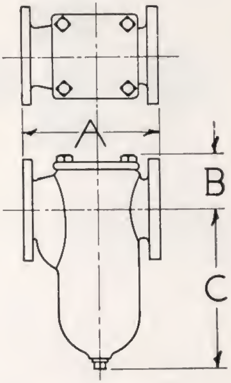
# The B&B Line of Dirt and Suction Strainers

## Specifications, Roughing-in and Performance Data

1. Body and cover fine grained grey cast iron, accurately machined
2. Yoke and hook on sizes ¾″, 1″ and 2″ fine grained cast iron accurately machined.
3. Adjusting screw, bolts and gaskets to the high standard of quality required by the B&B Line.
4. Sizes ¾″, 1″ and 2″ a round body, with round cover. Sizes 3″ and 4″ a round body but with a square cover.
5. Strainer collar, high quality brass, accurately machined and fitted in each strainer.
6. Cover removable on the ¾″, 1″ and 2″ sizes by loosening ONE screw, on the 3″ and 4″ sizes by loosening four cover bolts.
7. Strainer cylinder provided with 1/64″ perforations, and suitable for service on steam, gas or air.
8. Sizes ¾″, 1″ and 2″, for standard screwed connection, 3″ and 4″ for flange connection, companion flanges not being considered as standard equipment.
9. For liquid service, perforations are supplied 1/32″, all strainers being provided with a convenient handle to remove the gasket when required.

**Roughing-in Dimensions**

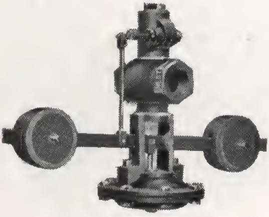


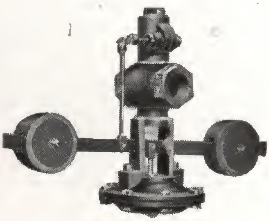


| Size Inches | A Inches | B Inches | C Inches | E Inches |
|---|---|---|---|---|
| ¾ x ¾ | 4⅝ | 3 1/16 | 5 3/16 | 3 5/16 |
| 1 x ½ | 4¾ | 3 1/16 | 5¼ | 3 5/16 |
| 1 x ¾ | 4¾ | 3 1/16 | 5¼ | 3 5/16 |
| 1 x1 | 4¾ | 3 1/16 | 5¼ | 3 5/16 |
| 2 x1¼ | 7¼ | 4⅞ | 8¾ | 5¼ |
| 2 x1½ | 7¼ | 4⅞ | 8¾ | 5¼ |
| 2 x2 | 7¼ | 4⅞ | 8¾ | 5¼ |
| 3 | 10⅜ | 3⅞ | 11⅝ | 7½ |
| 4 | 14½ | 4⅛ | 14⅞ | 9 |
| 5 | 16½ | 5 | 15½ | 10 |
| 6 | 16½ | 5 | 15½ | 10 |

# The B&B Line of Pressure Regulating Valves, Class A

The B&B Line of Class A Pressure Regulating Valves is suitable for reducing from initial pressure of 100 pounds down to any pressure on the reduced side to 5 pounds. For accurate work, and where the initial pressure exceeds 100 pounds, two valves should be installed, making first reduction to 50 pounds, and from 50 pounds down to pressure required. The B&B Line of Class A Pressure Regulating Valves reduce and maintain an even pressure of steam regardless of the variation of the initial pressure, or of the volume of steam required. They automatically reduce boiler pressure for steam heating systems of all kinds, including vacuum systems, and are of industrial service for reducing pressures in central heating plants, to engines, paper making machines, dye kettles, textile machinery such as slashers, etc.





The B&B Line of Class A Pressure Regulating Valves is made in sizes from ½″ to 1½″ inclusive, and will close tight on a variation of pressure of only four ounces, making this valve of great service in heating installations.

| Size Inches | Serial Num. | Weight Lbs. |
|---|---|---|
| ½x ½ | 3685 | 27 |
| ¾x ¾ | 3695 | 27 |
| 1 x1 | 3705 | 27 |
| 1¼x1¼ | 3715 | 33 |
| 1½x1½ | 3725 | 33 |

The operating pressure is transmitted to diaphragm from the low pressure side, through a half-inch pipe, which should be connected to low pressure main at least 15 feet from the valve. The diaphragm and all working parts are accessible without disturbing the pipe connections. These valves are threaded at both ends with standard right-hand pipe threads.

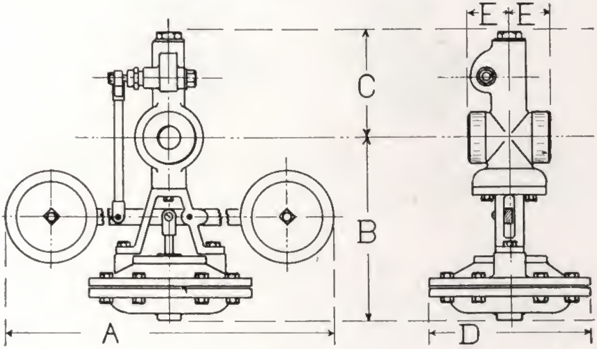
When it is necessary to connect the governing pipe close to the valve the use of a B&B Accumulator is recommended, and in specifying it is desirable to indicate the pressures at which the valve will be operated.

# The B&B Line of Pressure Regulating Valves Class A

## Specifications, Roughing-in and Performance Data

1. Body and bracket of fine grained cast iron, accurately machined.
2. Valves of wear-resisting selected bronze perfectly balanced. Piston type, 3 discs.
3. Links, levers and shaft of medium open hearth steel, accurately machined.
4. Brass caps, stuffing box nuts, valve bushings of steam brass accurately machined.
5. Screws nuts, bolts and set screws to high standards of quality required by the B&B Line.
6. Diaphragm, selected specially manufactured rubber composition to the B&B standard.

**Roughing-in Measurements**



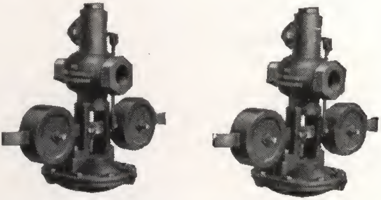
| Serial No. | 3685 | 3695 | 3705 | 3715 | 3725 |
|---|---|---|---|---|---|
| Pipe Size | ½″ | ¾″ | 1″ | 1¼″ | 1½″ |
| A | 28½″ | 28½″ | 28½″ | 28½″ | 28½″ |
| B | 8 17/32″ | 8 17/32″ | 8 17/32″ | 9 19/32″ | 9 19/32″ |
| C | 4 15/16″ | 4 15/16″ | 4 15/16″ | 5 11/16″ | 5 11/16″ |
| D | 7¾″ | 7¾″ | 7¾″ | 7¾″ | 7¾″ |
| E | 1 15/16″ | 1 15/16″ | 1 15/16″ | 3″ | 3″ |

Performance: These valves are so accurately balanced that they will open or close tightly on a variation of pressure of four ounces.

# The B&B Line of Pressure Regulating Valves, Class A, With Expanded Outlet

The B&B Line of Expanded Outlet, Class A, Pressure Regulating valves are made in sizes from ½-inch to 1½ inches, and are used for reducing steam. For accurate work where the initial pressure exceeds 100 pounds and pressures lower than 50 pounds are required, two valves should be installed in series. These valves automatically reduce boiler pressure for steam heating service of all kinds, and is suitable for installation in hotels, apartment houses, office buildings or in manufacturing plants.

The valve is perfectly balanced and will open wide or close tight with a variation of only 4 ounces of pressure. The valve is of the piston type, provided with a third disc which counter-balances the valve in all positions.



The B&B Line of Pressure Regulating Valves, Class A, with expanded outlets, are made in sizes from ½″ to 1½″ inclusive, serial numbers and weights being as follows:

| Size Inches | Serial Num. | Weight Lbs. |
|---|---|---|
| ½x1 | 4625 | 27 |
| ¾x1½ | 4615 | 33 |
| 1 x2 | 4635 | 40 |
| 1¼x2½ | 4645 | 45 |
| 1½x3 | 4655 | 50 |

The operating pressure is transmitted to the diaphragm from low pressure side through a half-inch pipe, which should be connected to low pressure main at least 15 feet from the valve. The diaphragm and all working parts are accessible without disturbing the pipe connections. These valves are threaded at both ends with standard right-hand pipe threads.

When it is necessary to connect the governing pipe close to the valve, the use of a B&B Accumulator is recommended. In all cases a stop valve should be inserted in the governing pipe. An accumulator will naturally protect the diaphragm from contact with steam, and it is an advisable installation.

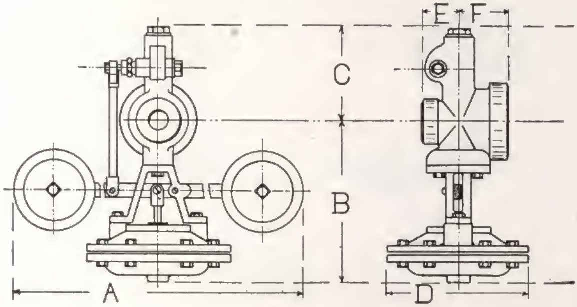
Pressure regulating valves small enough to work nearly wide open should be selected. When a valve of generous size is used, and with valves accordingly too large for the work, they will only partly open, and while the B&B Line of Class A Pressure Regulating Valves are equipped with valves made from the best steam brass, wire drawing in partly open valves will occur.

# The B&B Line of Pressure Regulating Valves, Class A, With Expanded Outlet

## Specifications, Roughing-in and Performance Data

1. Body and bracket of fine grained cast iron, accurately machined.
2. Valves of wear-resisting selected bronze, perfectly balanced, piston type, 3 discs.
3. Links, levers and shaft of medium open hearth steel, accurately machined.
4. Brass caps, stuffing box nuts, valve bushings of the best steam brass.
5. Screws, nuts bolts and set screws to the high standard of quality required by the B&B Line.
6. Diaphragm, selected specially manufactured rubber composition, to the B&B standard.
7. Diaphragm washers and nut of best brass, accurately machined.

**Roughing-in Measurements**



| Serial No. | 4625 | 4615 | 4635 | 4645 | 4655 |
|---|---|---|---|---|---|
| Inlet Pipe | ½″ | ¾″ | 1″ | 1¼″ | 1½″ |
| Outlet Pipe | 1″ | 1½″ | 2″ | 2½″ | 3″ |
| A | 28½″ | 28½″ | 28½″ | 28½″ | 28½″ |
| B | 8 17/32″ | 8 17/32″ | 8 17/32″ | 9 19/32″ | 9 19/32″ |
| C | 4 15/16″ | 4 15/16″ | 4 15/16″ | 5 11/16″ | 5 11/16″ |
| E | 1 15/16″ | 1 15/16″ | 1 15/16″ | 3″ | 3″ |
| F | 1 15/16″ | 2½″ | 2½″ | 3″ | 3″ |

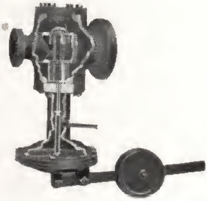
Performance: These valves are so balanced that they will open or close tightly on a variation of pressure of four ounces.

# The B&B Line of Pressure Regulating Valves, Class B

The B&B Line of Pressure Regulating Valves, Class B, is for use with medium initial pressures, not in excess of 100 pounds per square inch, and reducing to any desired pressure. The valve is offered in sizes from 2″ to 12″ for flange connections. Companion flanges are not considered as standard equipment, and must be specified if desired. This B&B Line is of special service and utility on heating systems.

For accurate work where initial pressure of 100 pounds and reduced pressure is less than 50 pounds, the use of two valves is recommended, making the first reduction from 100 to 50 pounds, and the final one from 50 to the service pressure. This valve is of the piston type, guided independently of the spindle or diaphragm and furnished with extra counter balanced disc, a feature that prevents surging.

Exterior



Interior

The sizes, serial numbers and weights of the B&B Line of Class B Pressure Regulating Valves are as follows:

| Size Inches | Serial Number | Weight Lbs. |
|---|---|---|
| 2 | 3585 | 95 |
| 2½ | 3595 | 110 |
| 3 | 3605 | 120 |
| 4 | 3615 | 138 |
| 5 | 3625 | 264 |
| 6 | 3635 | 310 |
| 8 | 3655 | 410 |
| 10 | 3665 | 540 |
| 12 | 3675 | 680 |

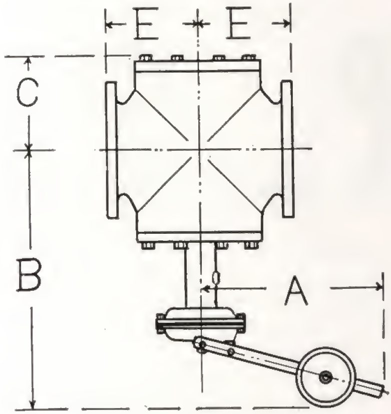
The B&B Class B Pressure Regulating Valve is controlled by means of a governing pipe, connecting the diaphragm chamber to the point on the heating main at which a steady pressure is to be maintained. The lever and weight may may be placed in any position convenient so as to avoid obstructions.

# The B&B Line of Pressure Regulating Valves, Class B

## Specifications, Roughing-in and Performance Data

1. Body, cover and upper and lower diaphragm casings of fine grained grey cast iron accurately machined.
2. Valve, valve stem, and valve stem collar of special wear-resisting bronze, accurately machined. Valve of the balanced, piston type.
3. Lever and fork of medium open hearth steel, accurately machined, lever equipped with cast iron counter weight of proper dimensions with set screw.
4. Water sealing tube of selected brass tubing, accurately fitted.
5. Taper pins, studs, cap screws, lever bolts and cover gaskets to the high standard of quality required by the B&B Line.
6. Diaphragm selected specially manufactured rubber composition to the B&B standard.

**Roughing-in Measurements**



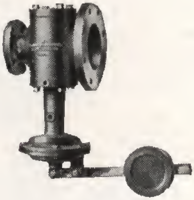
| Serial No. | 3585 | 3595 | 3605 | 3615 | 3625 | 3635 | 3655 | 3665 |
|---|---|---|---|---|---|---|---|---|
| Pipe Size | Inches 2 | Inches 2½ | Inches 3 | Inches 4 | Inches 5 | Inches 6 | Inches 8 | Inches 10 |
| A | 29¼ | 29¼ | 29¼ | 29¼ | 29¼ | 29¼ | 29¼ | 29¼ |
| B | 28 7/16 | 29 5/16 | 29⅝ | 30⅞ | 31 5/16 | 32 3/16 | 34 3/16 | 36⅝ |
| C | 4 | 4 13/16 | 5⅛ | 5⅜ | 7 | 7 11/16 | 9⅞ | 10 9/16 |
| E | 4⅝ | 5½ | 5½ | 6⅛ | 7 3/16 | 7⅜ | 9¼ | 10½ |
| F | 4⅝ | 5½ | 5½ | 6⅛ | 7 3/16 | 7⅜ | 9¼ | 10½ |

Performance: In selecting reducing valves it is advisable to use care to select sizes that will have low velocities, thus avoiding a whistle or a howl. Flanges on these valves are faced and drilled to standard templates unless otherwise specified.

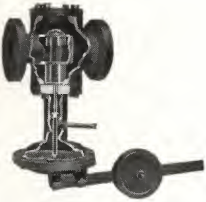
# The B&B Line of Pressure Regulating Valves, Class B, With Expanded Outlet

The B&B Line of Pressure Regulating Valves, Class B, is for use with medium initial pressures, not in excess of 100 pounds per square inch, and reducing to any desired pressure. The valve is offered in sizes from 2″ to 12″ for flange connection. Companion flanges are not considered as standard equipment and must be specified if required. This valve is of special service and utility on heating systems.

For accurate work where initial pressure is 100 pounds, two valves should be installed, making first reduction to 50 pounds and from there on to the final pressure. The valve is of the piston type, guided independently of the spindle or diaphragm and furnished with extra counter balanced disc, a feature that prevents surging.



Exterior



Interior

The sizes, serial numbers and weights of the B&B Line of Pressure Regulating Valves, Class B, are as follows:

| Size Inches | Serial Number | Weight Lbs. |
|---|---|---|
| 2 x 4 | 4895 | 97 |
| 2½x 5 | 4905 | 125 |
| 3 x 6 | 4915 | 135 |
| 4 x 8 | 4925 | 350 |
| 5 x10 | 4935 | 160 |
| 6 x12 | 4945 | 300 |

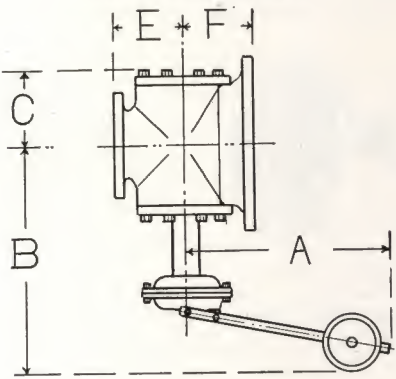
The B&B Line of Class B, Pressure Regulating Valve is controlled by means of a governing pipe connecting the diaphragm chamber to the point on the heating main at which a steady pressure is to be maintained. The lever and weight may be placed in any position convenient and so as to avoid obstructions.

# The B&B Line of Pressure Regulating Valves, Class B

## Specifications, Roughing-in and Performance Data

1. Body, cover and upper and lower diaphragm casings of fine grained grey cast iron, accurately machined.
2. Valve, valve stem and valve stem collar of special wear-resisting bronze, accurately machined. Valve of balanced piston type.
3. Lever and fork of medium open hearth steel, accurately machined, lever equipped with cast iron counter weight of proper dimensions with set screw.
4. Water sealing tube of selected brass tubing, accurately fitted.
5. Taper pins, studs, cap screws, lever bolts and cover gaskets to the high standard of quality required by the B&B Line.
6 Diaphragm, selected specially manufactured rubber composition to the B&B standard.

**Roughing-in Measurements**



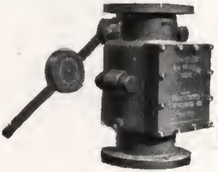
| Serial No. | 4895 | 4905 | 4915 | 4925 | 4935 | 4945 |
|---|---|---|---|---|---|---|
| Inlet Pipe.. | 2 | 2 1/2 | 3 | 4 | 5 | 6 |
| Outlet Pipe | 4 | 5 | 6 | 8 | 10 | 12 |
| A.......... | 29 1/4 | 29 1/4 | 29 1/4 | 29 1/4 | 29 1/4 | 29 1/4 |
| B.......... | 28 7/16 | 29 5/16 | 29 5/8 | 30 7/8 | 31 5/16 | 32 |
| C.......... | 4 | 4 13/16 | 5 1/8 | 5 3/8 | 7 | 7 11/16 |
| E.......... | 4 5/8 | 5 1/2 | 5 1/2 | 6 1/8 | 7 3/16 | 7 3/8 |
| F.......... | 4 5/8 | 5 1/2 | 5 1/2 | 6 1/8 | 7 3/16 | 7 3/8 |

Performance: In selecting reducing valves it is advisable to use care to select sizes that will have low velocities, thus avoiding a whistle or a howl. Flanges on these valves are faced and drilled to standard templates unless otherwise specified.

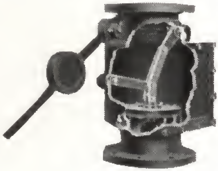
# The B&B Line of Back Pressure Valves

The B&B Line of Back Pressure Valves will open or close with a variation of only two ounces pressure. They are accordingly desirable for use as a relief valve for condensing engines, or as back pressure valves for non-condensing engines. When used as atmospheric exhaust relief valves they will remain closed while a vacuum is in the condenser, but should the vacuum be lost the valves open. Used on the exhaust line of non-condensing engines they maintain a given back pressure of steam for use in heating, drying, cooking, and other similar industrial uses of low pressure steam. The B&B Line of Back Pressure Valves is sensitive, reliable and noiseless in operation. On a condensing engine they may be used as an atmospheric relief during summer months, and as a back pressure valve in winter to furnish exhaust steam for heating purposes.

By means of the toothed clutch for the lever, the valve may be operated in a vertical, horizontal or inclined position. The weight levers may be reversed to hold the valve wide open if desired, the free area of the valve being greater than the exhaust pipe. Pulsations of exhaust steam cannot injure this valve; the composition valve disc closes tightly and will not wire-draw. The weight lever and connecting links are designed to prevent damage by pulsation and without the use of dash pots.



Exterior



Interior

The sizes, serial numbers and weights of the B&B Line of Back Pressure Valves are as follows. Companion flanges are not considered standard and must be specified if required.

| Size Inches | Serial Num. | Weight Lbs. |
|---|---|---|
| 1½ | 2755 | 42 |
| 2 | 2765 | 48 |
| 2½ | 2775 | 66 |
| 3 | 2785 | 75 |
| 4 | 2795 | 109 |
| 5 | 2805 | 193 |
| 6 | 2815 | 193 |
| 8 | 2835 | 298 |
| 10 | 2855 | 520 |
| 12 | 2865 | 595 |

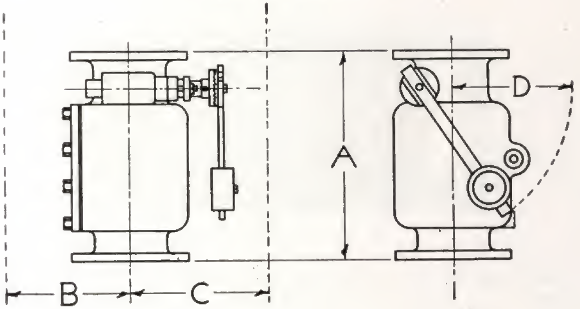
In specifying these valves, service, back pressure to be carried, for condensing or non-condensing engine connection, for back pressure or relief, and whether companion flanges are wanted should be stated.

# The B&B Line of Back Pressure Valves

## Specification, Roughing-in and Performance Data

1. Body and cover of fine grained grey cast iron, accurately machined
2. Valve disc, ring and cover of the best steam brass and selected composition.
3. Crank and crank shaft of medium open hearth steel, casting accurately machined, shaft accurately machined and keyed together.
4. Clutch hub and clutch top and cap, fine grained cast iron accurately machined and fitted.
5. Counter balance weight of grey cast iron mounted on weight lever of medium open hearth steel, being movable and with set screw to lock in desired position.
6. Pins and rollers in valve mechanism heat treated tool steel, finished smoothly
7. Gaskets, bolts, cap screws; cotter pins and gaskets to the high standard of quality required by the B&B Line throughout.
8. Long links and pins in large size back pressure valves of from 7″ to 12″ selected material accurately machined and fitted.

**Roughing-in Dimensions**



| Size | A | B | C | D |
|---|---|---|---|---|
| 1½″ | 11″ | 6″ | 7½″ | 24″ |
| 2″ | 11″ | 6″ | 7½″ | 24″ |
| 2½″ | 12″ | 7″ | 8½″ | 24″ |
| 3″ | 14″ | 7″ | 9″ | 24″ |
| 3½″ | 14″ | 7″ | 9″ | 24″ |
| 4″ | 16″ | 10″ | 11″ | 24″ |
| 5″ | 19¾″ | 12″ | 13″ | 30″ |
| 6″ | 19¾″ | 12″ | 13″ | 30″ |
| 7″ | 20¼″ | 16″ | 22″ | 30″ |
| 8″ | 20¼″ | 16″ | 22″ | 30″ |
| 10″ | 29¼″ | 18″ | 27″ | 30″ |
| 12″ | 31″ | 24″ | 36″ | 30″ |

Performance: The free area of the valve is greater than the exhaust pipe area, thus ample relief is afforded, and they are absolutely free from sticking, binding and overloading.

# The B&B Line of Accumulators

The B&B Accumulator is a cast iron device designed to always be partly filled with water, the surface of which transmits pressure to the diaphragm of a pressure regulating valve through a governing pipe. A water seal is formed for the valve diaphragm and a cushion results that effectively prevents surging of the valve, eliminating shocks to the diaphragm. This device likewise reduces to a minimum the change in static head in the governing pipe on the diaphragm, a very desirable feature as other connections often cause as much as 1 pound variation in this respect. The B&B Accumulator causes a constant water level in the line, equalizing connections, maintaining it half full at all times. The B&B Accumulator should be used in connection with the B&B Line of Pressure Regulating Valves for extremely accurate control.

The B&B Accumulator is made in one size only. Size, pattern serial number and weight being as follows:

| Size Inlet and Outlet Pipe | Part Number | Weight Lbs. |
|---|---|---|
| 1¼″ | 15203 | 28½ |

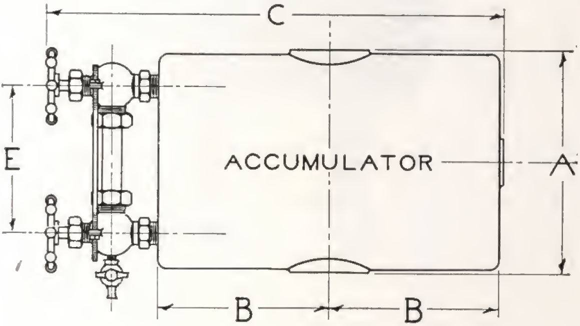
Gauge glass is not considered standard equipment with this specialty, and if wanted, must be specified extra, at additional cost.

# The B&B Line of Accumulators

## Specifications, Roughing-in and Performance Data

1. Body casting of fine grained grey iron, accurately cored and cleaned after casting. Painted black.
2. Inlet and outlet tappings 1¼″, accurately centered and machined
3. End opening ½-inch, accurately centered, drilled, threaded and plugged.
4. Openings for gauge glass accurately centered, drilled and threaded for ½″ pipe, and plugged.
5. If gauge glass is wanted, standard ½″ gauge cocks supplied with ½″ glass. Not supplied as standard equipment, and only if specified, at extra cost.

**Roughing-in Dimensions**



| Size | A | B | C | E |
|---|---|---|---|---|
| 1¼″ | 7⅛″ | 5½″ | 14¾″ | 4 11/16″ |

Performance: The B&B Accumulator will effectively prevent surging of pressure regulating valves when installed with equalizing connections. It permits of very accurate control of pressure, and its use prevents the motion of the diaphragm of a pressure regulating valve from affecting the level of the water in the governing pipe.

# The B&B Line of Cast Iron and Steel Receiving Tanks

The B&B Line of Cast Iron or Steel Receiving Tanks are offered for service in conjunction with the electric switch float operated, or steam valve float operated, for steam or electric pumps. The auxiliaries that make such service possible are described in their respective sections.

All B&B Receiving Tanks are furnished with cast iron cradles, affording a neat serviceable and correct setting.

The sizes, serial numbers and weights of the B&B Line of Receiving Tanks are as follows:

| Serial Nos. | | | Weight |
|---|---|---|---|
| 8705 | 1. | 20″x24″ Cast Iron | 350 |
| 8715 | 2. | 24″x30″ Steel Plate, All Joints Welded | 160 |
| 8725 | 3. | 24″x36″ Steel Plate, All Joints Welded | 165 |
| 8735 | 4. | 24″x48″ Steel Plate, All Joints Welded | 175 |
| 8745 | 5. | 30″x36″ Steel Plate, All Joints Welded | 185 |
| 8755 | 6. | 36″x48″ Steel Plate, All Joints Welded | 200 |

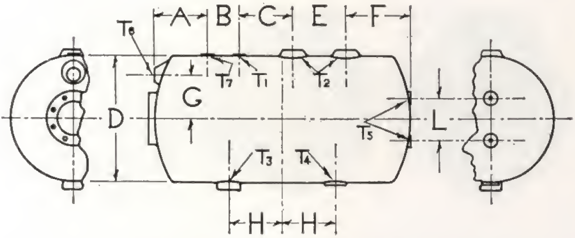
All the B&B Line of Receiving Tanks are subjected to a hydraulic test for tightness and are guaranteed to be tight.

# The B&B Line of Receiving Tanks

## Specifications, Roughing-in and Performance Data

1. The 20"x24" B&B Receiving Tank is a clean grey iron casting, all pipe openings being accurately machined and centered.
2. The other members of the series are steel plate tanks, accurately rolled to shape, and with heads dished. All joints are welded.
3. All tanks accurately tested by hydrostatic test for tightness.
4. All pipe bosses, special rolled bosses, accurately spaced and welded into place. Large flange coupling at end of each tank accurately drilled to standard bolt circles.
5. All B&B Receiving Tanks are furnished with supporting cradles.
6. Tanks are tapped for various pipe connections depending upon the size of tanks with which they will be used.
7. All tappings to standard pipe taps.
8. Tanks and cradles finished in black serviceable paint.

### Roughing-in Dimensions



| Size | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| 1 | 5⅞" | 0" | 6⅝" | 20" | 8¾" | 2⅜" | 8¼" | 0" |
| 2 | 6" | 4¼" | 5½" | 24" | 6¾" | 7½" | 8¼" | 6" |
| 3 | 6" | 6" | 6" | 24" | 10½" | 7½" | 8¼" | 9" |
| 4 | 10" | 6" | 10" | 24" | 10" | 12" | 8¼" | 10" |
| 5 | 6" | 6" | 6" | 30" | 10½" | 7½" | 8¼" | 9" |
| 6 | 10" | 6" | 10" | 36" | 10" | 12" | 8¼" | 10" |

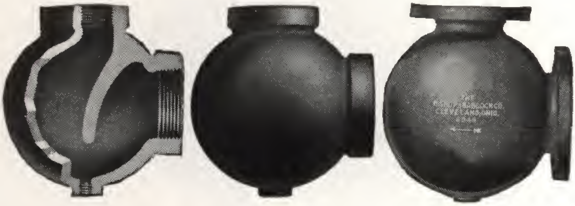
| Size | $T_1$ | $T_2$ | $T_3$ | $T_4$ | $T_5$ | $T_6$ | $T_7$ |
|---|---|---|---|---|---|---|---|
| 1 | 1¼" | 3" | 3" | 0" | ½" | 1" | 0" |
| 2 | 1" | 3" | 3" | 1" | ½" | 1" | ½" |
| 3 | 1" | 3" | 3" | 1" | ½" | 1½" | ½" |
| 4 | 1" | 3" | 3" | 1" | ½" | 1½" | ½" |
| 5 | 1" | 3" | 3" | 1" | ½" | 1½" | ½" |
| 6 | 1" | 3" | 3" | 1" | ½" | 1½" | ½" |

Performance: The B&B Line of Receiving Tanks are of sufficient holding capacity to be of adequate service with electric boiler feed or steam pumps for the following heating service:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | 20x24" | Cast Iron | 10,000 | Square | Feet | Heating | Surface |
| 2. | 24x30 | Steel | 20,000 | " | " | " | " |
| 3. | 24x36 | Steel | 35,000 | " | " | " | " |
| 4. | 24x48 | Steel | 45,000 | " | " | " | " |
| 5. | 36x48 | Steel | 60,000 | " | " | " | " |
| 6. | 30x36 | Steel | 45,000 | " | " | " | " |

# The B&B Line of Suction Ells

The B&B Line of Suction Ells is designed to collect condensation at the base of the lowest point in return mains, and permit this accumulation to readily be drawn into the suction chamber of the vacuum pump. They virtually lift condensation over an obstruction or from one level to another. The baffle plate inside the pot of the ell forms a water seal up to the lift point, and thus horizontal mains will not become water logged but are completely drained. The B&B Line of Suction Ells is for vertical lifts only, the vertical pipe connection being one size smaller than the horizontal.



The sizes, patterns, serial numbers and weights of this B&B Line are as follows:

| Suction | Discharge | Type | Serial Number | Weight Lbs. |
|---|---|---|---|---|
| ¾" | ½" | screwed | 3735 | 1½ |
| 1 " | ¾" | screwed | 3745 | 2 |
| 1¼" | 1 " | screwed | 3755 | 3 |
| 1½" | 1¼" | screwed | 3765 | 4½ |
| 2 " | 1½" | screwed | 3775 | 6 |
| 2½" | 2 " | screwed | 3785 | 11 |
| 3" | 2½" | screwed | 3795 | 16 |
| 3½" | 3 " | screwed | 5145 | 25 |
| 4 " | 3½" | flanged | 5155 | 50 |
| 6 " | 5 " | screwed | 5165 | 70 |
| 8 " | 6 " | flanged | 5175 | 90 |

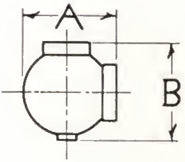
The B&B Suction Ells are made with a sufficient radius to the curves to prevent frictional losses, the momentum of water is maintained and assists in making the lift with the minimum loss of vacuum. A tapping in the bottom of the ell is provided for clean out, should this ever be necessary.

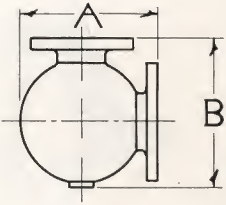
# The B&B Line of Suctions Ells

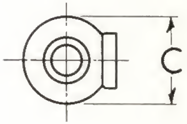
## Specifications, Roughing-in and Performance Data

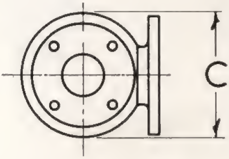
1. All castings of fine grained grey cast iron. Perfect ly cleaned accurately machined.
2. Sizes ¾′ to 3″ inclusive, furnished tapped.
3. Sizes 3½″ to 8″ inclusive, furnished flanged. Flanges drilled to standard bolt circles, but companion flanges not furnished as standard equipment. If companion flanges are wanted they must be specified.
4. Every suction ell furnished with drilled, tapped and plugged opening at base, for cleanout.
5. All B&B Suction Ells finished black.

### Roughing-in Dimensions







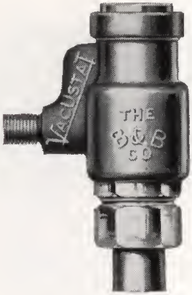


| Size | A | B | C |
|---|---|---|---|
| ¾″ | 2½″ | 3⅛″ | 2¼″ |
| 1 ″ | 3 ″ | 3 9/16″ | 2¾″ |
| 1¼″ | 3 11/16″ | 4⅛″ | 3¼″ |
| 1½″ | 4 11/16″ | 5 1/16″ | 4⅛″ |
| 2 ″ | 5⅛″ | 5⅝″ | 4¾″ |
| 2½″ | 6 9/16″ | 7 ″ | 6¼″ |
| 3 ″ | 7 15/16″ | 8⅜″ | 7⅜″ |
| 3½″ | 10 ″ | 10 11/16″ | 8 15/16″ |
| 4 ″ | 11 ″ | 11 11/16″ | 9 15/16″ |
| 6 ″ | 15½″ | 16 3/16″ | 14 7/16″ |
| 8 ″ | 17 5/16″ | 19⅝″ | 16⅝″ |

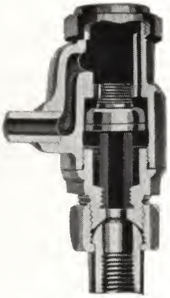
Performance: A B&B Suction Ell forms a seal. Vacuum will not reach the return main to which it is connected until the return line is free from condensation. When free from condensation, suction takes place and vacuum is maintained. Hammer is positively eliminated.

# The B&B Line of Vacu-Stats

The B&B Line of Vacu-Stats is a specialty in a class by itself, used for venting radiators on air line systems of heating. It has no carbon post or rod, which is relied upon so largely by other types of venting valves, to close and open a port. The Vacu-Stat makes use of an expansion button, a hand spun phosphor bronze member filled with a volatile liquid. The Vacu-Stat is a thermostatic valve which automatically keeps radiators and pipes free from air, and at the same time seals in steam. One is installed on each radiator or coil, and often at the end of a steam main to insure positive, thorough and quick circulation.



Exterior



Interior

The B&B Line of Vacu-Stats is furnished in two size connections as follows:

| Size Inches | Serial Number | Net Weight |
|---|---|---|
| ⅛x¼ | 1285 | 13 oz. |
| ¼x¼ | 1295 | 13 oz. |

The Vacu-Stat has three times the venting capacity of the average type of air valve, and their use insures of steam reaching radiators instantly, quick heating resulting. Each Vacu-Stat is thoroughly tested and properly adjusted at the factory, no adjustments being required in installation.

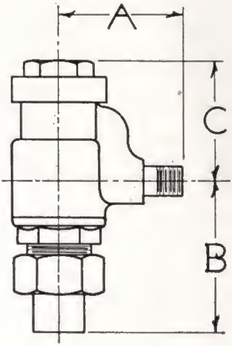
# The B&B Line of Vacu-Stats

## Specifications, Roughing-in and Performance Data

1. Body, top cap and bottom cap of heavy steam brass, polished and nickeled.
2. Inlet nipple of best steam brass, nickel finish, brazed to body.
3. Thermal member of hand spun phosphor bronze, filled with volatile liquid by the B&B process.
4. Valve seat of correct flexibility to positively and perfectly seat valve.
5. Swivel and nut of heavy brass, polished and nickeled.

The thermal member of the Vacu-Stat expands on contact with steam and closes the passage. On contact with air it contracts, allowing air to vent, connection being made through the swivel to the air line and thence to vacuum pump.

**Roughing-in Dimensions**



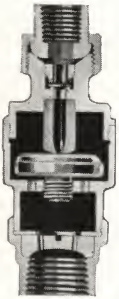
| Size | A | B | C |
|---|---|---|---|
| ⅛x¼ | 1¾″ | 2″ | 1¾″ |
| ¼x¼ | 1¾″ | 2″ | 1¾″ |

Performance: Vacu-Stats are guaranteed to relieve the air at all times and close against steam from any heating system to which applied. The capacity in square feet of direct radiation is 150 for each type. Operates on pressures up to 15 pounds.

# The B&B Line of Vacu-Checks

The Vacu-Check is a heating specialty used for venting pipe coils, indirect radiators, and the ends of mains of air line systems of heating. It is a combination thermostatic valve and check valve. It permits the free passage of air from radiators and radiating equipment and prevents the return of air to the system. It prevents the escape of steam or vapor from the systems to which applied, and is installed on the end of the steam supply main. The Vacu-Check will not drain off water of condensation.

Exterior



Interior

The sizes, weights and serial numbers of the B&B Line of Vacu-Checks are as follows:

| Size Inches | Serial Number | Net Weight |
|---|---|---|
| ½"x ¼" | 495 | 13 oz. |
| 1 "x ½" | 745 | 2¼ lbs. |

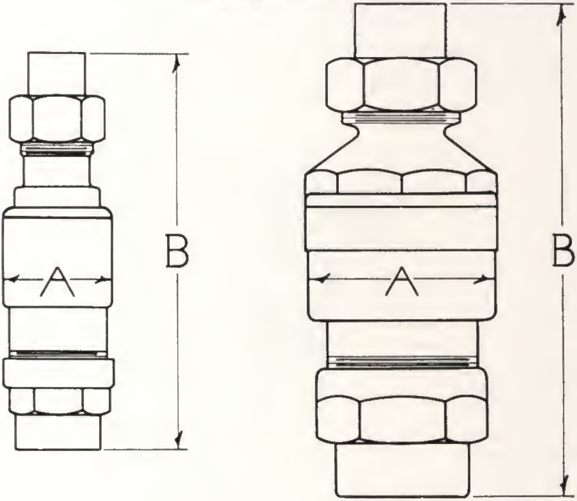
The Vacu-Check is positive seating, and is substantially made from heavy steam brass throughout. It is accurately and permanently adjusted at the factory. Operates on pressures up to 15 pounds.

# The B&B Line of Vacu-Checks

## Specifications, Roughing-in and Performance Data

1. The Body, inlet cap and inlet cap washer of highest quality steam brass, accurately machined.
2. The outlet cap, outlet cap nut of highest quality steam brass, accurately machined.
3. Thermal member of hand-spun phosphor bronze by the special B&B Process, and filled by the B&B Process with volatile liquid.
4. Valve seat of the correct flexibility to positively and perfectly seat the valve.
5. Outlet swivel and nut of extra heavy high quality brass, accurately machined and fitted.
6. Each Vacu-Check is accurately and permanently adjusted at the factory.

**Roughing-in Dimensions**



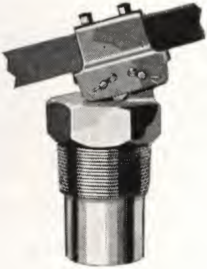
| Size | A | B |
|---|---|---|
| ½ x ¼" | 1 5/16" | 4 ½" |
| 1 x ½" | 2 ¼" | 5 ¾" |

Performance: The valve is provided with a diaphragm containing a volatile liquid that expands and contracts with rise or fall of temperature. The check feature prevents air from flowing back into lines after it has once been expelled. The two sizes have the following capacities:

| Size | Capacity Sq. Ft. Direct Rad. |
|---|---|
| ½ x ¼" | 300 |
| 1 x ½" | 1000 |

# The B&B Line of Multiflex Hot Water Damper Regulators

The B&B Multiflex Hot Water Damper Regulator used on hot water boilers controls the temperature of water within 2 degrees Connected at top of boiler as illustrated and chain connecting front and rear draft. Contains a B&B Multiflex Bellows, made of special composition brass. The volatile liquid is hermetically sealed between the outside wall and bellows. The slighest temperature change of the water actuates the bellows.



| Size | Serial No. | Weight |
|---|---|---|
| 2″ | 7065 | 2¼ lbs. for thermal member only.<br>11 lbs. for complete assembly, thermal member weight, rod, two pulleys, two hooks and 21 feet of chain. |

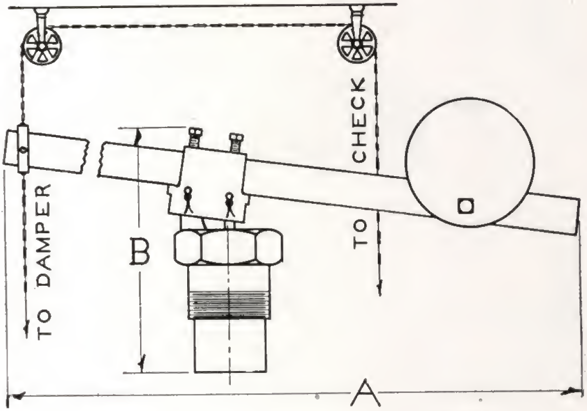
The thermal member is manufactured to the high standard of the B&B Line by the special B&B process of making Multiflex bellows of heavy metal, welded with block tin and not soldered, and filled with a volatile liquid giving great sensitiveness. The B&B Hot Water Damper Regulator saves its cost many times in fuel saving.

# The B&B Line of Hot Water Damper Regulators

## Specifications, Roughing-in and Performance Data

1. Thermal member body of high quality brass, accurately machined to which a spun copper base is tinned. Body threaded to a 2-inch pipe thread, and containing a B&B Multiflex Bellows, accurately tested, adjusted and filled with volatile liquid for this particular service. Rod yoke of pressed metal, and with twin set screws to hold weight rod where set.
2. Weight rod ¾″x¼″, flat rod cut to 36″ length, ends drilled to take hooks for chains.
3. Weight cast iron, slot accurately machined and fitted with ⅜″ set screw.
4. Chain for hooking to weight rod, and to furnace door furnished in 21-foot length.
5. Pulleys, 2″ shieve, finished black japan, two furnished with each regulator and with screw ends.
6. Two S-hooks provided to engage holes in weight rod and hook into end of chain.

**Roughing-in Dimensions**

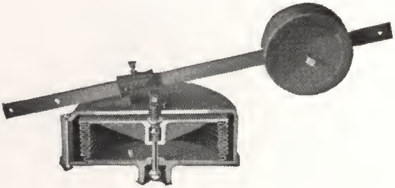


A=36″ B=6¾″

Performance: The B&B Hot Water Damper Regulator is a practical, automatic, universal type of thermal regulator for hot water installations. It controls the rate of combustion in proportion to the demand for heat, and being all metal without rubber or similar diaphragms it will last indefinitely. The sensitiveness of the B&B Hot Water Damper Regulator gives exact regulation, and a saving in fuel.

# The B&B Line of Multiflex Vapor Damper Regulators

The B&B Vapor Damper Regular is specially designed for use on vapor installations. It automatically regulates the draft and maintains a constant pressure in the boiler at or near atmospheric pressure. The 8″ B&B Multiflex Vapor Damper Regulator will control pressures when properly installed to a variation of not over TWO ounces of the point to which set. The diaphragm cannot be blown out and no precautions from excess pressures or high vacuums are necessary.



| Size | Serial No. | Weight |
|---|---|---|
| 1″ Pipe | 5715 | Weight, rod, 2 pulleys, 2 hooks, and 21′ chain=8¾ lbs. total weight. |

Weight=5¼ lbs., rod=2 lbs., chain pulleys and Hooks=1½ lbs. Total=8¾ lbs.

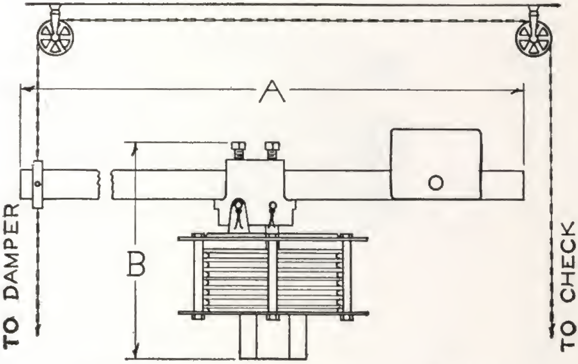
The bellows of the B&B Multiflex Vapor Damper Regulator has 8 corrugations and 16 flexing surfaces and is made of special composition brass, no solder being used at joints, but special block tin sweated joints, insuring of tightness and durability.

# The B&B Line of Multiflex Vapor Damper Regulator

## Specifications, Roughing-in and Performance Data

1. Multiflex bellows, 8″ in diameter, extremely sensitive and made from selected material by the B&B process. Will operate on pressures up to 10 pounds.
2. Body and cover of heavy casting, finished black. Fastened to bottom plate and thermal member.
3. Diaphragm stem, of the best steam brass, accurately fitted.
4. Rod yoke of pressed metal, fully nickeled; provided with twin set screws.
5. Weight, rod, lock nuts, bolts and fittings to the B&B standard of quality.
6. Pipe connection 1″.

**Roughing-in Dimensions**



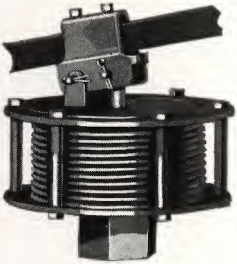
A=36″ B=6½″

Performance: The B&B Multiflex Vapor Damper Regulator is supersensitive, and will automatically control vapor pressure to within 2 ounces of the point at which set, and for a range from atmospheric to 16 ounces or more vapor pressure. When the vapor pressure rises above the point to which set, the multiflex diaphragm expands, raises the weighted lever, which opens the check and closes the draft dampers by means of the connecting chains. Conversely when the pressure drops, the drafts are automatically reversed.

# The B&B Line of Multiflex Steam Damper Regulators

The B&B Steam Damper Regulator is a damper regulator making use of the B&B Multiflex Bellows manufactured by the B&B process. The bellows are made by a special process from special and selected metal and will withstand hard usage for an indefinite period. In shop tests at the B&B factory our bellows have been flexed over 200 million times, no change of structure occurring, in fact, such bellows showing practically no alteration from the original state.

Heavy top and bottom plates with rod separators protect the moving part, the lever is evenly balanced and the device extremely sensitive. No valve is required between the boiler connection and the regulator, as no precaution from excess pressure or high vacuum is required.



| Size | Serial | Weight |
|---|---|---|
| 1″ Pipe | 4395 A | Weight, rod, 2 pulleys, 2 hooks, and 21 feet of chain=8¾ lbs.<br>Complete Assembly=12½ lbs. |

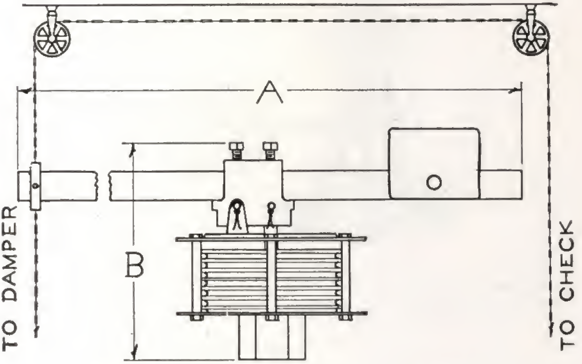
The B&B Steam Damper Regulator is for use on low pressure boilers, operates directly from boiler pressure without motors or other means, and automatically controls to within ¼-pound boiler pressure, by operating the draft and check dampers. The moveable weight gives a range of pressures from ½-pound to 15 pounds.

# The B&B Line of Multiflex Steam Damper Regulators

## Specifications, Roughing-in and Performance Data

1. Multiflex bellows of selected materials, specially heavy, and manufactured by the B&B method. Suitable for pressures up to 15 pounds.
2. Body and cover of accurately made stampings, finished frosted nickel. Pipe boss of best steam brass, securely fastened to assembly.
3. Rod yoke of pressed metal, fully nickeled, provided with twin set screws to hold weight rod where set.
4. Diaphragm stem of best brass, accurately machined and fitted
5. Weight rod, weight, lock nuts, machine bolts to the B&B standard of quality.

**Roughing-in Dimensions**



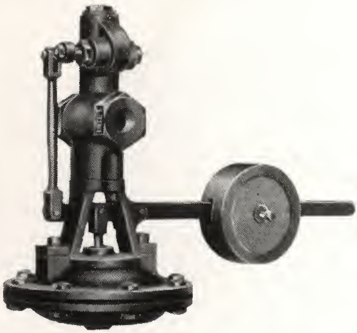
A=36″ B=6½″

Performance: The B&B Multiflex Steam Damper Regulator is extremely sensitive and will automatically control pressure to within ¼-pound to which set, and for a range of from ½-pound up to 15 pounds. When steam pressure rises above that for which set, the multiflex diaphragm expands, raises the weighted lever, which opens the check and closes the draft damper through the connecting chains.

# The B&B Line of Steam Vacuum Pump Governors

The B&B Steam Vacuum Pump Governor is designed for use in connection with steam driven vacuum pumps, or where a certain number of inches of vacuum are to be maintained. It is made in sizes from ⅜″ to 1½″ inclusive, for controlling the speed of steam operated vacuum pumps and for maintaining any degree of vacuum. The valve is perfectly balanced and will not surge, the vacuum pump being at all times under perfect control. The diaphragm and all working parts are readily accessible without disturbing pipe connections.

The valve is of the piston type, perfectly balanced, and will operate with a variation of ½-inch of vacuum. The seat area is 10% larger than the pipe connections, and full steam pressure is transmitted to the cylinder of the pump.



The sizes, serial numbers and weights of the B&B Steam Vacuum Pump Governors are as follows:

| Size | Serial Number | Weight Lbs. |
|---|---|---|
| ⅜″ | 3385 | 27 |
| ½″ | 3195 | 27 |
| ¾″ | 3205 | 27 |
| 1″ | 3215 | 27 |
| 1¼″ | 3375 | 33 |
| 1½″ | 3815 | 33 |

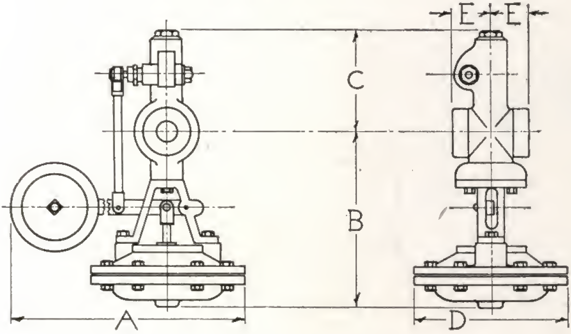
If these governors are used for any other purpose than controlling a vacuum pump it is desirable to specify the exact service, so that the governor can be altered to meet such requirements.

# The B&B Line of Steam Vacuum Pump Governors

## Specifications, Roughing-in and Performance Data

1. Body and bracket of fine grained grey cast iron, accurately machined.
2. Valves of wear-resisting, selected bronze, perfectly balanced. Piston type, 3 disc.
3. Links, levers and shaft of medium open hearth steel, accurately machined.
4. Brass caps, stuffing box nuts, valve bushings of the best steam brass.
5. Screws, nuts, bolts and set screws to the B&B standard of quality.
6. Diaphragm selected specially manufactured rubber composition to the B&B standard.
7. Diaphragm washers and nut of the best brass, accurately machined.

**Roughing-in Dimensions**



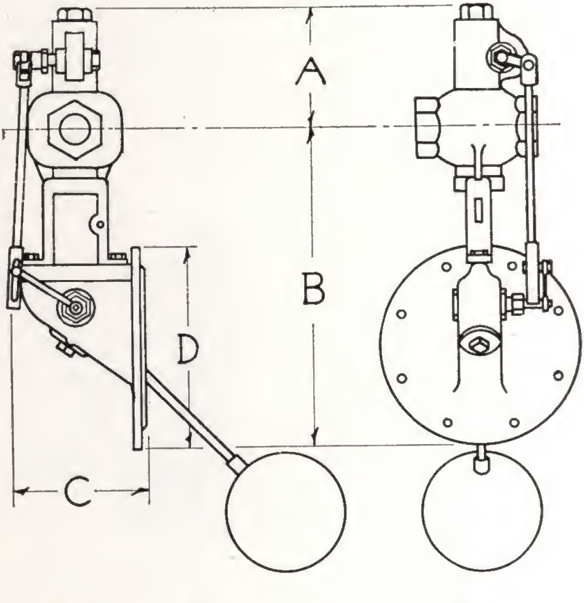
| | A | B | C | D | E |
|---|---|---|---|---|---|
| ⅜″ | 18⅛″ | 8½″ | 5″ | 7¾″ | 2″ |
| ½″ | 18⅛″ | 8½″ | 5″ | 7¾″ | 2″ |
| ¾″ | 18⅛″ | 8½″ | 5″ | 7¾″ | 2″ |
| 1″ | 18⅛″ | 8½″ | 5″ | 7¾″ | 2″ |
| 1¼″ | 18⅛″ | 9⅝″ | 5¾″ | 7¾″ | 3″ |
| 1½″ | 18⅛″ | 9⅝″ | 5¾″ | 7¾″ | 3″ |

Performance: The B&B Steam Vacuum Pump Governor will operate with a variation of but ½-inch of vacuum, and because of the large seat opening, full steam pressure is transmitted to the steam piston. This valve is good for variable vacuum conditions, suitable for low vacuums and suitable for high vacuum work.

# The B&B Line of Float Head and Steam Pump Governor Attachments

The B&B Float Head and Pump Governor is designed to control the steam operated boiler feed pumps, so that water of condensation entering the receiver will be discharged immediately into the boiler. This head and pump governor attachment is used in connection with the B&B Line of Receiving Tanks.

**Roughing-in Dimensions**



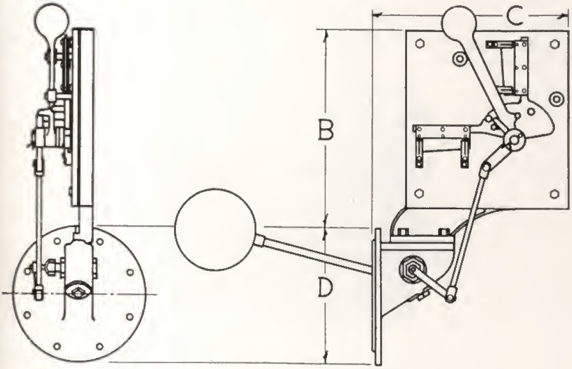
| A | B | C | D |
|---|---|---|---|
| 5¾″ | 15½″ | 7″ | 10″ |

| Size Inches | Serial Number | Weight Lbs. |
|---|---|---|
| ⅜ | 8505 | 37 |
| ½ | 8515 | 37 |
| ¾ | 8525 | 37 |
| 1 | 8535 | 37 |
| 1¼ | 8545 | 37 |
| 1½ | 8555 | 37 |

# The B&B Line of Float Heads and Electric Switches

The B&B Float Head and Electric Switch attachment is designed to automatically start and stop electrically driven pumps automatically, so that water of condensation entering the receiver will be discharged immediately into the boiler. This float head and electric switch attachment is used in connection with the B&B Line of Receiving Tanks.

**Roughing-in Dimensions**



| B | C | D |
|---|---|---|
| 14½″ | 12″ | 10″ |

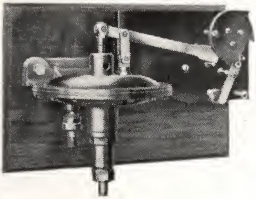
| Size | Serial No. | Weight Lbs. |
|---|---|---|
| 1 Pole | 8765 | 46 |
| 2 Pole | 8775 | 46 |
| 3 Pole | 8785 | 46 |

The switch is of the positive or snap-acting type, opened or closed by a weighted lever, insuring of positive contact and preventing arcing. The switch board is of selected slate supported on the cast iron bracket and head piece, and is perfectly insulated.

# The B&B Line of Electric Switch and Vacuum Controllers

The B&B Line of Electric Switch and Vacuum Controllers is an automatic electric control for operation of electrically operated vacuum pumps. A switch is actuated by a diaphragm and which can be adjusted externally to any desired degree of vacuum.

The electric switch is mounted on a slate back, and the entire assembly encased in an iron box to comply with underwriters' requirements. The switch has a snap action which prevents arcing and insures of positive contact.



The B&B Electric Switch and Vacuum Controller is made in but one size, the serial number and weight being as follows:

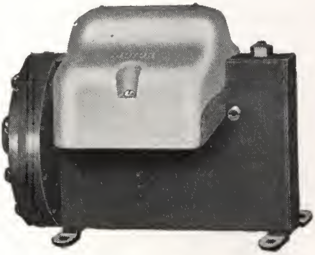
| Item | Serial No. | Weight |
|---|---|---|
| B&B Electric Switch and Vacuum Controller | 1859 | 22 lbs. |

The switch should be connected with a magnet control switch where polyphase or direct current motors are used.

Size of over all dimensions 8½"x15".

# Electric Switch and Pressure Controller

The electric switch and pressure controller is used to automatically start and stop an electric driven air compressor used on temperature control systems. The switch will maintain a pressure of 30 lbs. in the receiving tank and is suitable for either direct or alternating current, for motors up to 2 H. P. The adjustments of this automatic control are made to cut in at approximately 23 lbs. and out at 30 lbs. or other suitable pressures.



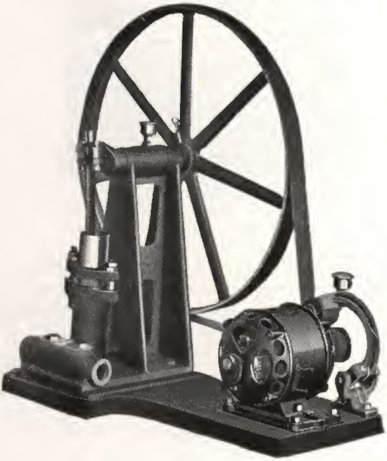
The electric switch is approved by the Underwriters and is so constructed that it can be mounted in any suitable place, being of the inclosed type, fully protected, No cross line starter switch is required when using this type of pressure control.

Size of over all dimensions 6¾″ long, 5″ wide, 5¾″ high. Weight 8 lbs

# The B&B Line of Electric Air Line Vacuum Pumps

The B&B Line of Electric Air Line Vacuum Pumps is designed to draw all air from radiators on Air Line Vacuum Systems through the air piping. The B&B Air Line Vacuum Pumps are of the plunger type, self-contained upon a single bed plate with the motor. They are of exceptionally heavy construction with bronze lined cylinders special hard composition valves with bronze seats and stems. The valves are easily accessible for renewal. The pump is driven by belt to the motor, a belt tightener provided.

**The B&B Electric Air Line Vacuum Pump No. 1279**



The size, serial number and weight are as follows:

| Serial No. | Cylinder Diameter | Stroke | Suction | Discharge | RPM | H.P. | Weight |
|---|---|---|---|---|---|---|---|
| 1279 | 2¼″ | 3″ | 1″ | 1″ | 75 | 1/6 | 370 |

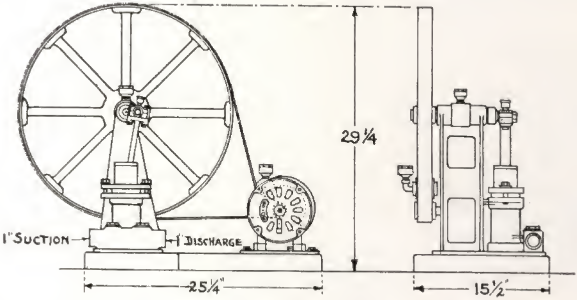
# The B&B Line of Electric Air Line Vacuum Pumps

## The B & B Electric Air Line Vacuum Pump No. 1279

### Specifications, Roughing-in and Performance Data

1. Motor and pump mounted on a single base of grey cast iron, accurately machined.
2. Pump a single cylinder, plunger type, bronze lined cylinders.
3. Valves of hard special composition with bronze seats and stems.
4. Belt driven, with belt tightener as standard equipment.
5. Bearings full bronze, provided with brass grease cups.
6. Standard equipment furnished with the pump includes:
   - A. 1 18-gallon tank.
   - B. 1 B&B Electric Air Line Vacuum Pump No. 1279.
   - C. 1 Automatic Electric Switch and Vacuum Controller No. 1859.
   - D. 1 B&B Suction Strainer 4619.
   - E. 1 B&B Vacuum Gauge.
7. Motor to suit electrical characteristics of proposed installation and which must be completely described. For polyphase 25-cycle or 550-volt current an extra cross the line switch must be used, and is not listed above.

**Roughing-in Dimensions**
**Foundation and Clearance Dimensions**



Performance: The B&B Electric Air Line Vacuum Pump No. 1279 is furnished as a complete outfit, including tank gauge motor and switch, constructed of the highest quality materials and workmanship, and is complete in every respect. Operated at rated speed it has the following capacity:

| Pump Unit | Suction | Discharge | Strokes per Min. | H.P. | Capacity max. in Sq. Ft. Direct Rad. |
|---|---|---|---|---|---|
| No. 1279 | 1″ | 1″ | 150 | 1/6 | 3000 |

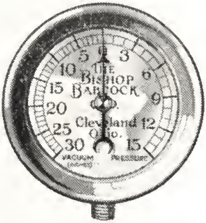
# The B&B Line of Gauges

The B&B Line of Gauges embraces both the vacuum type and the compound type.

The vacuum gauge is used for accurately indicating the pump performance. It is connected to the expansion tank in series with the tank and vacuum controller, and it is a convenient means for setting the vacuum control switch.

The compound gauge is placed on the boiler, indicating steam pressure as well as vacuum, as the case may be, and is required on vacuum and vacu-vapor systems of steam circulation. The dial is graduated to 15 pounds steam pressure on the right-hand side of the dial, and to 30 inches of vacuum on the left-hand side. The compound gauge is 5″ in diameter, brass trimmed, and having a ¼″ pipe connection.

Vacuum Gauge

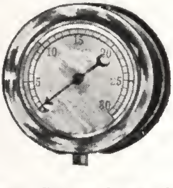


Compound Gauge

| Gauge Type | Diameter | Pipe Connections | Weight |
|---|---|---|---|
| Vacuum | 5″ | ¼″ | 2 lbs. |
| Compound | 5″ | ¼″ | 2 lbs. |

The B&B Line of Gauges are individually tested for accuracy, they are a tried, tested, measured and adjusted line. All similar parts in these gauges are interchangeable, and all have a non-corrosive movement mounted direct on the socket. The movement cannot be thrown out of adjustment when the gauge is being installed. Any gauge should be kept reasonably cool to register correctly, and hence on steam and vacuum work a coil pipe siphon should be used. The B&B Line of Gauges are sensitive, non-freezing and the pointer will not vibrate excessively.

The B&B Line of Air Pressure Gauges are of the same quality construction as the vacuum and compound gauges described above. They have non-corrosive movements mounted direct on the socket.

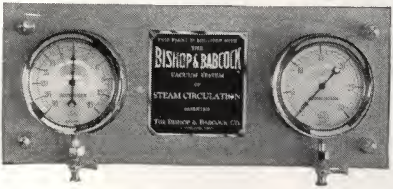


The B&B Air Pressure Gauges have nickel-plated trim, flanged back, and register to 30 pounds pressure. Pipe connection is ¼″.

| Type | Dial | Weight |
|---|---|---|
| Air | 2½″ | 1 lb. |
| Air | 3½″ | 1½ lb. |

# The B&B Line of Gauge Boards

For use with vacuum systems. This outfit comprises one board of wood, slate or marble, 11 inches wide and 26½ inches long, one vacuum gauge for indicating the degree of vacuum produced by the pump, and one compound gauge for indicating the pressure or vacuum on the boiler. Also one nickel plated brass name plate and pet cocks for each of the gauges, and four nickel plated screws or bolts for attaching board to wall.



**B&B Gauge Board**

| Type | Weight |
|---|---|
| Wood | 40 lbs. |
| Slate | 47 lbs. |
| Marble | 47 lbs. |

For use with heating systems a vacuum and compound gauge is mounted side by side as illustrated. The gauges are finished in highly polished nickel, and nickel-plated pet cocks are provided. A set of four nickel-plated screws or bolts to attach the gauge board to the wall is standard equipment with each gauge board.

# The B&B Line of All-Metal Thermostats

The B&B All-Metal Thermostat is furnished in special types for all vapor and steam heating installations. They assure exact heat control. When the B&B All-Metal Thermostat is used in conjunction with the B&B Multiflex Pneumatic Valve, the most complete and efficient temperature control system is possible.

As standard equipment the B&B All-Metal Thermostat is offered in three types, the Graduate type, the Positive type, and the Compound type.

The Positive Type Thermostat is of such construction that it is either fully open or tightly shut, that is, there is no intermediate position. It is used extensively on 1-pipe steam systems.

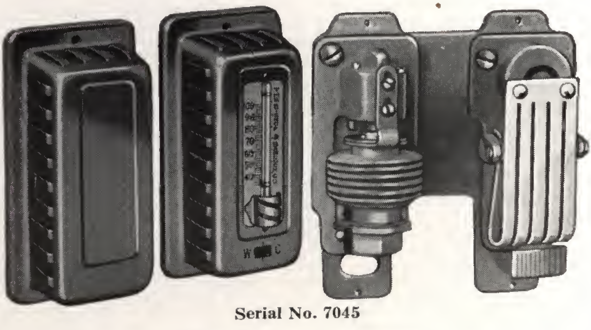
The Graduate Type Thermostat is of such construction that it throttles, that is, it will maintain a valve in an intermediate position, It is used extensively on vacuum and vapor systems.

The Compound Type Thermostat is a combination of both Positive and Graduate types. The positive feature operates radiators. while the Graduate feature is utilized to operate dampers, i. e. the ventilating in a split system or partly direct, and partly indirect system of heating.

**Serial No.**
**Graduate 5625**

**Positive 7115**

**Positive or Graduate Type Thermostat**



**Serial No. 7045**

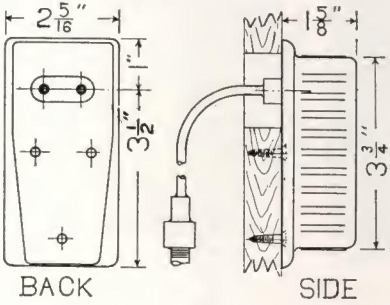
**Compound Type Thermostat**

# The B&B Line of All-Metal Thermostats

## Specifications, Roughing-in and Performance Data

1. All-Metal, all parts accurately proportioned, cover metal and supplied in any finish to match room hardware.
2. Moving parts a single element, this being a double seated air valve operated directly by the thermal member.
3. Thermal element an INVAR sheet with no thermal expansion welded to brass sheet of high thermal expansion.
4. Thermal member slotted longitudinally to eliminate cross deflection and to give added radiation surface, making this thermostat highly sensitive and controlling temperature within limit of less than one degree.
5. Frame of such a design that operation of thermal member is not affected by expansion and contraction of it due to wall temperature.
6. Air valve a large port valve, operating stem moving up and down through port, preventing dust clogging, and being self-cleaning.
7. Key Adjustment.

**Roughing-in Dimensions**



Performance: The B&B All-Metal Thermostat when installed in conjunction with the B&B Multiflex Pneumatic Valve and in accordance with installations meeting with the approval of the B&B engineers will positively control the temperature in a room or group of rooms to within 1 degree Fahrenheit of the point at which set.

The B&B Thermostat is a pneumatic thermostat that should be located about 5 feet from the floor of the room whose temperature it regulates, as at this point the mean temperature is obtainable. On a rising temperature the metallic element expands, opening the pneumatic valve and closing the exhaust to atmosphere, thus allowing compressed air at 15 pound pressure to pass through the thermostat to the B&B Pneumatic Valve. The B&B Pneumatic Valve acts on 15 pounds pressure, the spring therein is compressed and the valve closes, shutting off the steam supply to the radiator. On a falling temperature the reverse takes place, the exhaust in the thermostat opens and the air pressure lessens due to the escape of air, and the valve in the B&B Pneumatic Valve automatically opens. The combination is extremely sensitive, positive, and controls temperature within limits of less than 1 degree.

## THE BISHOP & BABCOCK ALL-METAL DUPLEX THE RMOSTAT

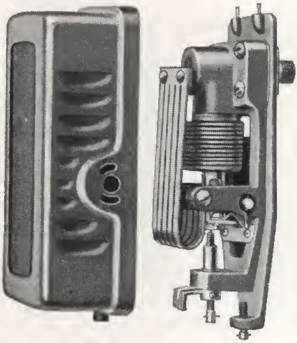
The B&B All-Metal Duplex Thermostat is the latest development in Temperature Control Apparatus for applications of Temperature Control to buildings where control of individual rooms or sections is desirable.

From a standpoint of economy both of installation and operation the apparatus is far in advance of anything that has been produced to date to combine individual and group control, with complete control of the building, for schools, office buildings, hotels and public buildings.

The use of this instrument makes it possible without any elaborate arrangement of piping and hand-control valves to operate the entire building with control when desired, and at the same time provides a method whereby any one room or section or group of rooms in the building may be provided with heat, while the portions of the building in which heat is not desired are cut off from the source of steam, except where the temperature drops to a point sufficiently low to make freezing temperature a possibility.

The apparatus is tried and proven, has been specified and indorsed by some of the leading engineers in the country, and is in use in many large public buildings.

The B&B All Metal Duplex Thermostat is manufactured in positive, intermediate and compound types, and is used in connection with the B&B Multiflex All Metal Pneumatic Valves and other specialties.



**Serial No.**
**Positive—9125**
**Graduate—9145**
**Compound—9155**

**Distinctive features of the Thermostat include the following:**

All metal; accurately proportioned; covers supplied in any finish to match hardware.

Highly sensitive, controlling temperature within limit of less than one degree.

Simple mechanism, with but two moving parts—a double-seated air valve operated directly by the thermal member, and a bellows used to move the thermal member into position when normal operating air pressure is put into the piping system.

Thermal member mounted on frame; operation not affected by expansion and contraction of frame due to wall temperature.

Thermal member slotted longitudinally to eliminate cross deflection and to give added radiation surface.

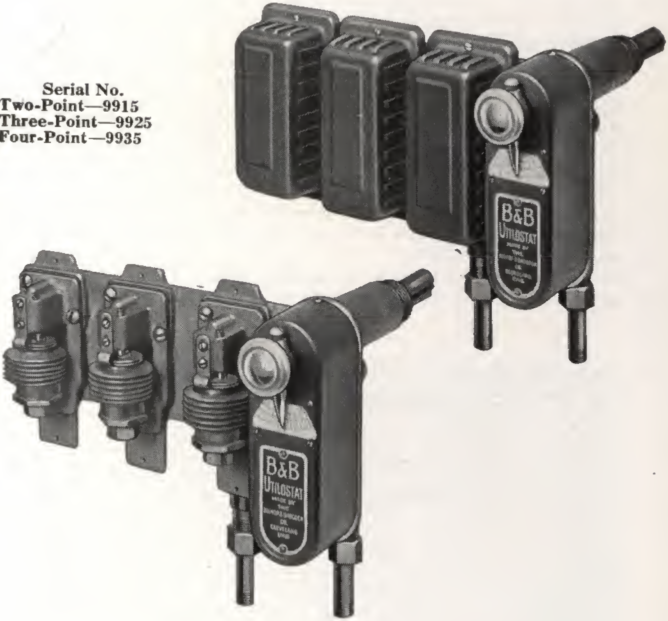
Metal is sheet of Invar (a special nickel steel) having practically no thermal expansion welded to sheet of high expansion brass.

Air valve is a large port valve with operating stem which moves up and down through port; thus it cannot clog with dust; self-cleaning No microscopic holes for passage of air.

The operation of the thermostat is such that no change is required in the regular method of installing air piping except that an additional small line is run from the source of air supply which is connected to the bellows of each instrument. In this line is placed a control valve.

## COMPOUND UTILOSTAT

**Serial No.**
**Two-Point—9915**
**Three-Point—9925**
**Four-Point—9935**



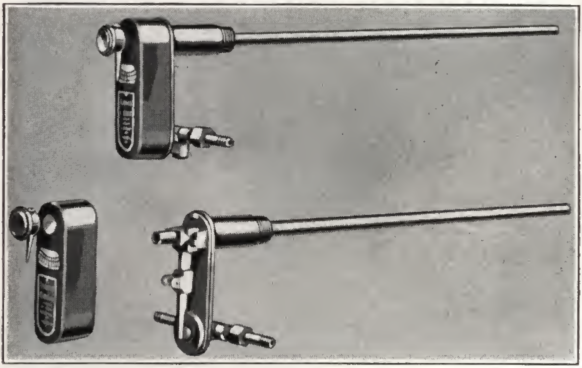
This instrument is designed to function on the same principle as the Bishop & Babcock Utilostat described on the following page, and to accomplish the same result as an installation of several individual Utilostats, the relay instruments being used to control vento coils for example, with graduate action thru the Utilostat member on dampers.

The amount of piping is reduced in making the installation and a more satisfactory and workmanlike job is possible than with unit controls with individual Utilostats.

The instrument is made positive or graduate type with one, two or three points or relay members in accordance with the requirements of the installation.

# The B&B Line of Utilostats

The B&B Utilostat is an all-metal thermostat with a tubular extension for controlling temperatures by operating an air port in the air line to a diaphragm valve that controls the heat supply. It is extremely sensitive, operating on a temperature range of but ¼ to ⅛ of a degree Fahrenheit. It will make four expansions and contractions per minute, and it has an operating range of from 50 to 600 degrees Fahrenheit. It is of durable construction, provided with knife edged bearings, and contains no stuffing boxes or similar sources of trouble. The B&B Utilostat is designed to operate on air. The B&B Utilostat when used with other B&B specialties for temperature control, pneumatically controls pipe coils or coil valves, vent sections or by-pass dampers, and located under the tempering coils in a ventilating system. For such service the tube is inserted through the wall of a Plenum chamber, or in the main duct. Such an installation permits the working parts to be on the outside of the ventilating equipment and in a position for ready inspection and adjustment.



The service, serial number and weight of the B&B Line of Utilostats are as follows:

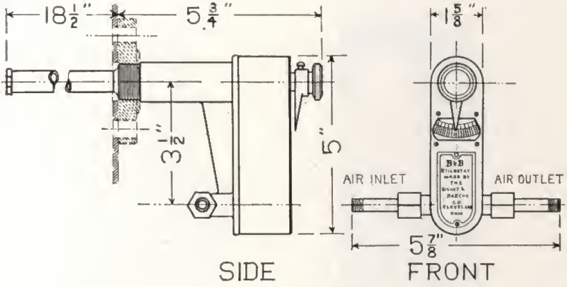
| For Use With | Serial No. | Weight |
|---|---|---|
| Air. Graduate | 2125 | 4 lbs. |
| Positive | 4405 | 4 lbs. |

# The B&B Line of Utilostats

## Specifications, Roughing-in and Performance Data

1. All-metal, all parts accurately proportioned, cover durably finished in dull black, non-corrossive.
2. Moving part a single element, this being a double-ported air valve, operated directly by thermal element.
3. Thermal element is a seamless brass tube
4. Tube, a seamless brass tube, brazed joints at end and where it is fastened to frame.
5. Frame of a design that prevents interference due to its expansion with the functioning of the expansion member.
6. Air valve, a large port valve.
7. Hand screw or key adjustment.

**Roughing-in Dimensions**



Performance: The B&B Line of Utilostats will effectively control the temperatures of liquids, gases or air at practically the point at which set. It is of service and well adapted to the following usage, for controlling the temperatures of apparatus of all kinds.

1. Closed, induction or barometric feed water heaters.
2. Tank and storage, heaters, using live or exhaust steam, gas or coal fuel.
3. Hot water heating systems, and air duct temperatures in ventilation.
4. Fuel oil heaters, and tempering oil baths.
5. Processes in paper, wood preservation, pasteurization, textile finishing and similar work.
6. For cookers, digesters, and all manner of similar industrial equipment.
7. For control of distillates and fractional distillation of all kinds.

In short, wherever there exists the necessity of control of temperature, the Utilostat is of service INDUSTRIALLY.

# The B&B Line of Hygrostats

The B&B Hygrostat is a device for controlling humidity, and is of service in connection with temperature control systems. A sensitive wooden cylinder of cross-grained maple is the actuating element. The expansion of this element when the humidity rises, causes a port to open in the valve mechanism which permits compressed air to actuate a diaphragm valve. The diaphragm valve operates a humidifier, operating a spray head, water pan or similar arrangement. Contraction of the maple element shuts off the air, exhausting to the atmosphere in doing so, and the diaphragm valve is not balanced and causes the spray heads to operate until the humidity reaches a point at which the Hygrostat is set.

The B&B Hygrostat is furnished in but one size, but in finish to match room hardware. The serial number and weight are as follows

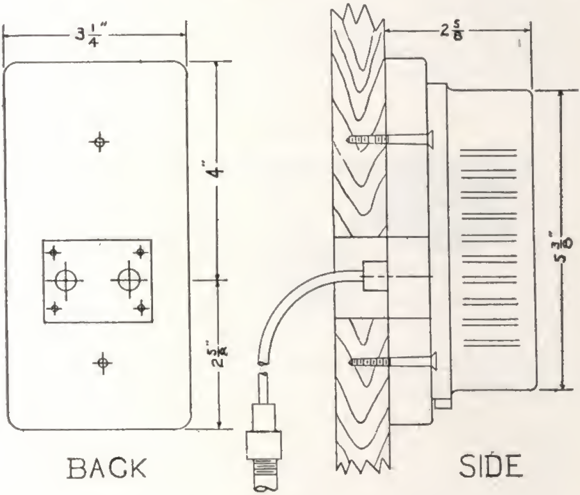
| Item | Serial No. | Weight |
|---|---|---|
| Room Type | 5115 | 2 lbs. |
| Duct Type | 8675 | |

# The B&B Line of Hygrostats

## Specifications, Roughing-in and Performance Data

1. Cover and frame metal, accurately machined and any finish.
2. Moving part, double seated air valve, operated by actuating element.
3. Actuating element of hard cross-grained maple, especially selected for sensitiveness to variation in humidity. Indestructible.
4. All parts accurately proportioned, adjusted and tested at the factory.

**Roughing-in Dimensions**

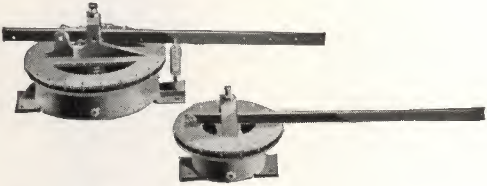


Performance: The B&B Hygrostat will control the humidity at the point where it is located within a range of 2% of the point at which it is set. For example, if set for a relative humidity of 58% it will open the valve on spray heads when the relative humidity falls to 57%. In turn when the relative humidity reaches 59% it will close the valve. The B&B Hygrostat is a sensitive and effective humidity controlling device.

# The B&B Line of Damper Motors

The B&B Multiflex Damper Motors are for use in temperature control systems for controlling the mixing, by-pass, louvre or other types of dampers used on such systems to control ventilation. They are operated by compressed air and are connected by means of an ⅛″ air line to a B&B Thermostat or an Utilostat, or to a 3-way switch.

These damper motors are all-metal construction, the body being a heavy casting enclosing a multiflex diaphragm. The air controlling their operation passes through a B&B Thermostat or Utilostat and acting on the damper motor diaphragm raises the lever which is connected to the dampers. When a thermostat or Utilostat on expansion shuts off the air to a damper motor the air pressure on the diaphragm is relieved and the lever moves in the opposite direction and closes or opens the dampers.



The sizes, serial numbers and weights of the B&B Line of Damper Motors are as follows:

| Size | Serial No. | Weight |
|---|---|---|
| 4½″ | 5075 | 9 lbs. |
| 8″ | 5255 | 25 lbs. |

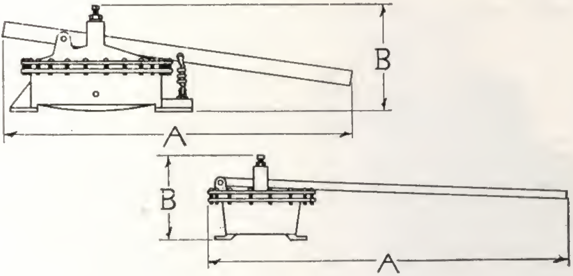
A B&B Damper Motor attached to a by-pass damper, located under a heater coil, is operated by a Utilostat, for tempering air. Attached to cut-off vent, or fresh air dampers, they may be controlled pneumatically by a three-way switch conveniently located. Such three-way switches may be located in any part of the building and will control dampers located in any part of the building.

# The B&B Line of Multiflex Damper Motors

## Specifications, Roughing-in and Performance Data

1. Body and cover of fine grained grey cast iron, accurately machined.
2. Diaphragm flange, stem and spring of high quality bronze suitable for this service.
3. Diaphragm, special bronze composition, corrugated and manufactured by the B&B process of making multiflex bellows and diaphragms.
4. Bolts, nuts, set screws and springs to the high standard of quality required by the B&B Line.
5. Lever, flat steel, smoothly finished, properly drilled, fulcrum pins accurately fitted.
6. All-metal construction, no rubber diaphragm and noiseless in its operation.

**Roughing-in Dimensions**



| Size | A | B |
|---|---|---|
| 4″ | 25″ | 6″ |
| 8″ | 25″ | 7½″, |

Performance: The B&B Multiflex Diaphragm Motors will effectively operate any and all types of ventilating dampers, wherever located, when properly connected to the damper lever arms, and when the multiflex damper motors are properly connected to pneumatically operated thermostats or utilostats, they are equally effective on a pneumatic system manually operated through three-way switches into the air controlling lines.

# The B&B Line of Pneumatic Switches

For the manual control of dampers through the operation of the B&B Line of Damper Motors, the B&B Line of Push-Button and Three-Way Pneumatic Switches are offered. The B&B Pneumatic Switches are ruggedly and accurately manufactured, are positive in their action, relieving air rapidly and completely when in the relief position, and operating without leakage when in the open position.

The B&B Line of Push-Button Pneumatic Switches are an all-brass construction, and are exceptionally heavy and durable. The case is furnished in frosted brass, with polished trim, or in full nickel plate. "ON" and "OFF" are legibly marked on the wall plate, raised letters being used.

The B&B Line of Three-Way Switches are an all-brass pneumatic three-way valve, with extended stem, the stem terminating in a squared end ingaging the hub of the indicating lever. The extended stem passes through a solid brass plate, plainly marked with the name of the damper under control by that particular switch, and with a plainly marked position for "OPEN" or "CLOSED."

**Push-Button Switch**

**Three-Way Switch**

The finish on these switches is supplied in any finish desired or to match that of the hardware in the room or rooms in which installed.

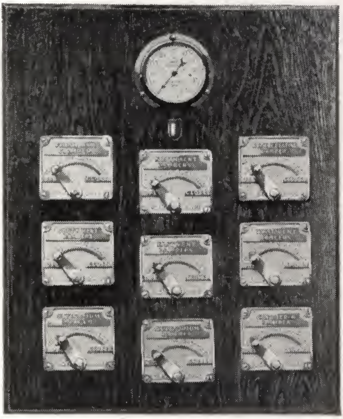
# The B&B Line of Pneumatic Switches

## Specifications, Roughing-in and Performance Data

1. The B&B Push-Button Switch is an all-brass pneumatic switch. Body and cover being heavy brass castings. Button frame a heavy brass casting, accurately machined.
2. The push-buttons are of brass rod accurately machined and fitted, and properly tensioned by brass snap springs.
3. The valves are large port valves, the operating stem moving up and down through port, preventing clogging by dust and dirt and self-cleaning.

1. The B&B Three-Way Switch is an all-brass valve, with extension stem, accurately machined and fitted.
2. Index plate solid brass casting, properly stamped "OPEN" and "CLOSED," and with name of damper or valves that they operate.
3. Lever solid brass, properly finished and fitted with finished lock nut to hold on squared end of the extension stem.
4. Valve equipped with ¼″ air pipe, properly proportioned and bent to standard curviture.

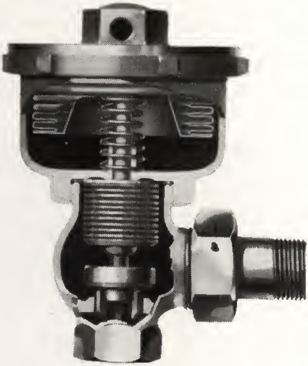
Both types of valves finished in any desired finish to match the hardware.



Performance: The B&B Push-Button or Three-Way Switch will positively control and operate damper motors located at distant points and where the pneumatic piping is tight and properly installed. The Three-Way Switch may be installed individually or in groups, and are accordingly conveniently mounted on the B&B Line of Boards, which is furnished in solid marble, in slate, or in hard wood. A dozen or more Three-Way Switches may be mounted on a board. A typical installation is shown in the above cut:

# The B&B Line of Multiflex Pneumatic Valves

The B&B Line of Multiflex Pneumatic Valves are quick and accurate opening and closing valves used for regulation of heat entering radiators. Their action is governed by the thermostat or utilostat to which they may be connected, the use of which with the B&B Multiflex Pneumatic Valves gives an automatic temperature control system of the highest quality and greatest serviceability. The B&B Multiflex Pneumatic Valves are connected to a thermostat, either of the positive or graduate type by ⅛″ air piping, in which an operating pressure of 15 pounds is maintained by means of an air compressor.



**Bishop & Babcock**
**Multiflex Pneumatic Valve**

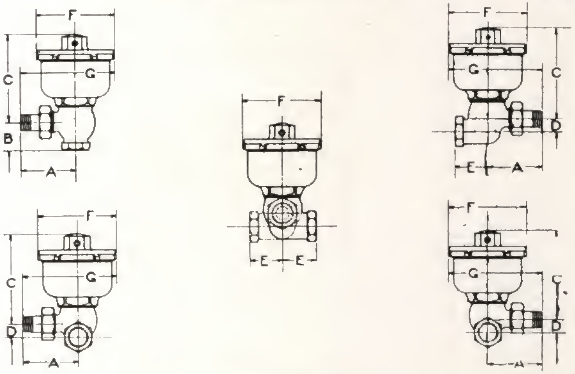
When a thermostat expands, due to heat, the air is automatically allowed to flow to the Multiflex pneumatic valve, and which, acting on the multiflex bellows therein, closes the valve tightly on its seat. Conversely when the thermostatic element contracts the air valve in the thermostat closes, exhausting the air, relieving the air pressure on the multiflex pneumatic valve, and opening the valve. In the graduate type, the operation is the same excepting that the valve in the pneumatic valve rises proportionally with that in the thermostat, namely is graduated as to the temperature.

# The B&B Line of Pneumatic Valves

## Specifications, Roughing-in and Performance Data

1. Body and cap of heavy steam metal castings, fully nickeled with polished trimmings.
2. Multiflex diaphragm made by the B&B process and giving a metal diaphragm possessing more corrugations than are found in any valve of equal size.
3. Multiflex bellows sweated to the head with block tin, a joint that is permanent.
4. The B&B Multiflex Packing, manufactured from special composition brass prevents the entrance of steam and water into the diaphragm chamber.
5. The valve stem projects through a free bronze washer, and its terminal spun over the valve body proper, integral with the multiflex packing.
6. The washer is locked into position between the body and the bonnet of the valve, thus forming a sealed air compartment, and impervious to steam and water.
7. There are no gaskets, all joints are metal to metal.
8. Valve disc holder fitted with the ball and socket joint, assuring of proper seating. Seats and discs are interchangeable and renewable.
9. These valves have extra high lift, are noisless in operation, are factory adjusted and tested and require no attention after installation.
10. The valve spring is located in the air compartment, cannot come in contact with steam or water, and a perfectly balanced valve results.
11. Swivel and nut of heavy brass castings are furnished with each valve, finished polished nickel.

**Roughing-in Dimensions**



½'' to 2'' Sizes

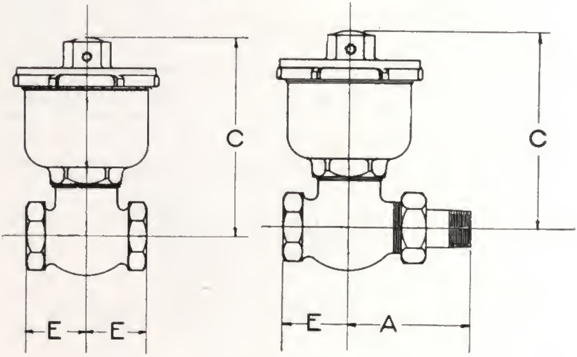
| Size | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| ½ | 2 11/16 | 1 3/8 | 4 7/16 | 21/32 | 1 5/8 | 3 7/8 | 4 5/8 |
| ¾ | 3 | 1 13/32 | 4 13/32 | 23/32 | 1 11/16 | 3 7/8 | 4 15/16 |
| 1 | 3 3/8 | 1 9/16 | 4 9/32 | 31/32 | 1 15/16 | 3 7/8 | 5 5/16 |
| 1¼ | 3 11/16 | 1 23/32 | 5 29/32 | 1 | 2 11/8 | 6 | 6 11/16 |
| 1½ | 4 11/32 | 2 ¼ | 5 15/16 | — | — | 6 | 7 11/32 |
| 2 | 4 ½ | 2 9/16 | 6 ¼ | — | — | 6 | 7 ½ |

| Angle | R. H. | L. H. |
|---|---|---|
| 10005 | 10025 | 10035 |
| 10055 | 10075 | 10085 |
| 10105 | 10125 | 10135 |
| 10155 | 10175 | 10185 |
| 10205 | | |
| 10235 | | |

# The B&B Line of Pneumatic Valves

(Continued)

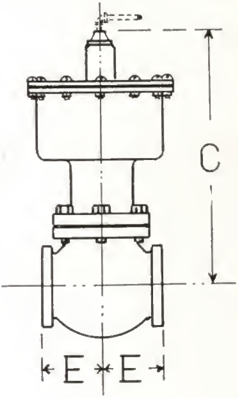
**Roughing-in Measurements**



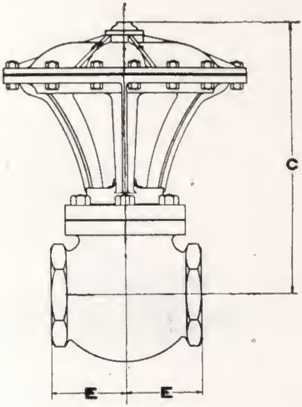
**½″ to 2″ Sizes**

| SIZE | A | C | E | Serial Globe | Serial No. Globe Union |
|---|---|---|---|---|---|
| ½ | 2 23/32 | 4⅞ | 1½ | 10045 | 10015 |
| ¾ | 3 5/32 | 4⅞ | 1⅝ | 10095 | 10065 |
| 1 | 3 7/16 | 4⅞ | 1¾ | 10145 | 10115 |
| 1¼ | 3 25/32 | 6½ | 2 1/16 | 10195 | 10165 |
| 1½ | 4½ | 6 15/16 | 2½ | 10225 | 10215 |
| 2 | 4 9/16 | 7 7/16 | 2⅞ | 10255 | 10245 |

**Globe Pattern**



2½" to 5" Sizes

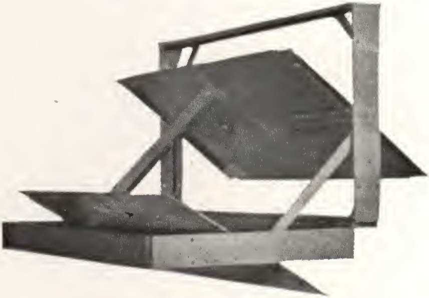


6" to 10" Size

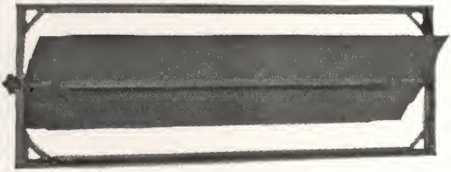
These valves are furnished either screwed or flanged, as specified. Flanges not furnished with Valves.

| Size | Type | E | C | Serial No. |
|---|---|---|---|---|
| 2½ | Angle Screwed | 3⅝ | 3⅝ | 8065 |
| 2½ | Globe Screwed | 3¾ | 3⅝ | 8075 |
| 3 | Angle Screwed | 4¼ | 5 | 8585 |
| 3 | Angle Flanged | 4¼ | 5 | 8085 |
| 3 | Globe Screwed | 3⅞ | 5 | 8575 |
| 3 | Globe Flanged | 3⅞ | 5 | 8095 |
| 3½ | Angle Screwed | 5⅛ | 20 | 5835-A |
| 4 | Globe Flanged | $5\frac{9}{16}$ | 20½ | 5815-A |
| 5 | Globe Flanged | $6\frac{9}{16}$ | 21½ | 5825-A |
| 6 | Globe Screwed | 8 | 21¾ | 10325 |
| 6 | Globe Flanged | 7⅜ | 21¾ | 10335 |
| 7 | Globe Screwed | $8\frac{5}{16}$ | 22½ | 10345 |
| 7 | Globe Flanged | 7¾ | 22½ | 10355 |
| 8 | Globe Screwed | $9\frac{1}{16}$ | 23¼ | 10365 |
| 8 | Globe Flanged | $8\frac{5}{16}$ | 23¼ | 10375 |
| 10 | Globe Screwed | 11 | 25¼ | 10385 |
| 10 | Globe Flanged | $10\frac{5}{16}$ | 25¼ | 10395 |

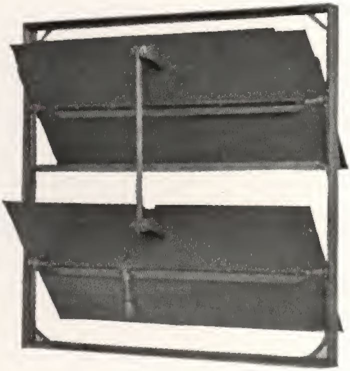
# The B&B Line of Dampers



**B&B Mixing Damper**

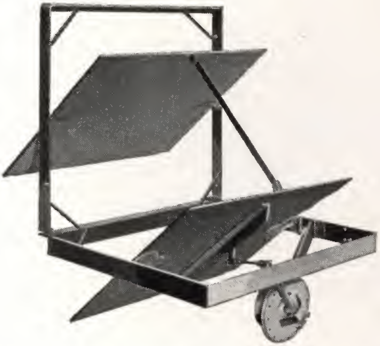


**B&B Single Damper**

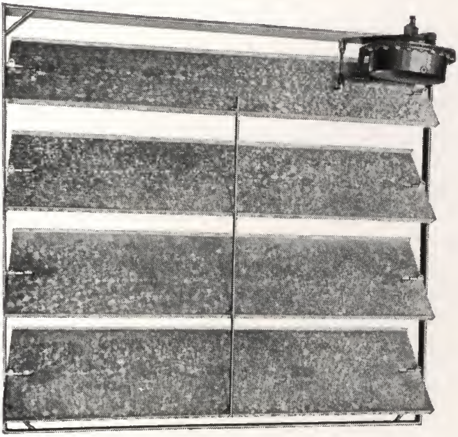


**B&B Louvre Damper**

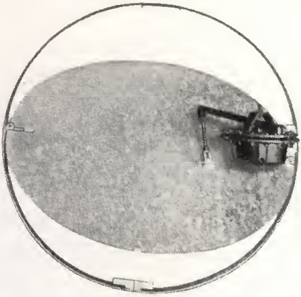
# The B&B Line of Dampers



B&B Mixing Damper Motor Mounted Type



B&B Louvre Damper Motor Mounted Type

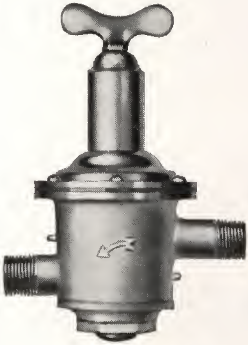


Circular Damper—Motor Mounted Type

The Bishop & Babcock Dampers, as illustrated on preceding pages are used with The Bishop & Babcock Temperature Control System. All our dampers are perfectly balanced and operated on brass trunnions so that accurate control is always assured. The damper blades are of heavy sheet steel. These blades are connected with a strong rod and assume parallel position under all operating conditions. With this arrangement the action of the intermediate thermostat insures proper mixing at the plenum chambers, at the fresh air inlets, at the by-pass inlets or at any point where our dampers are installed. This arrangement prevents sudden and unpleasant air changes in the rooms Moreover, at any angle at which the damper may be held, through the thermostat's intermediate action, predetermined air delivery will not be affected.

# The B&B Line of Air Pressure Regulators

The B&B Air Pressure Regulator is used to reduce air pressure from the common 30 pounds pressure to the standard 15 pounds pressure carried in the piping system of a thermostatic or a manually operated temperature control system. The B&B Regulator is installed in the main air line after the air tank, and between the operating apparatus, thermostats, push-button switch, three-way switch, as the case may be.



**Air Pressure Regulator**

The sizes, serial numbers and weights of the B&B Line of Pressure Regulators are as follows:

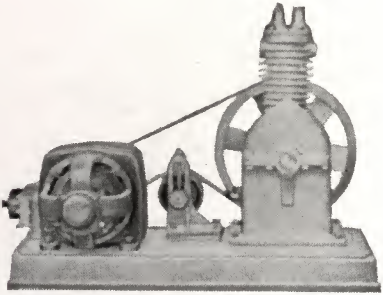
| Type | Size | Serial No. | Weight Pounds |
|---|---|---|---|
| Air | ⅛ | 457 | 1¼ |
| Air | ¼ | 467 | 1¼ |
| Air | ⅜ | 477 | 2 |
| Air | ½ | 1067 | 2 |

**Air Regulator Specifications**

1. All-brass construction, body and cap being heavy castings, accurately machined.
2. Diaphragm, spun bronze, provided with a bronze spring.
3. Adjusting nut and stud, high quality brass, accurately machined.
4. Assembly accurately tested and adjusted.

# The B&B Line of Air Compressors

The B&B Line of Air Compressors is for use with temperature regulating systems. They may be belted to the ventilating fan shaft, and may be had with single tight pulley or equipped with tight and loose pulley. These compressors are simple in design and durably constructed. The B&B Automatic Switch stops the motor automatically when 30 pounds pressure is reached in the storage tank. After a drop of 7 pounds in this pressure the motor is automatically started and the tank refilled. No attention is required aside from an occasional oiling.



The compressor, equipped with a tight pulley only, is popular on heating installations, no belt shifter being required. When a desired pressure is reached in the storage tank, an automatic unloader permits air discharge to atmosphere, the compressor operating unloaded. A drop of 1 to 1½ pounds in the pressure in the tank causes the compressor automatically to pick up its load and function until the unloader discharges again.

The B&B Line of Air Compressor are compact, occupy small space and are dependable. The electrical type is mounted complete on a single bed plate motor belted to compressor.

## Electric Air Compressors

**Belt Driven with Idler**

| Stats | Size Inches | No. of Cylinders |
|---|---|---|
| Up to 20 | 1⅝x2 | 1 |
| Up to 40 | 2⅛x2½ | 1 |
| Up to 60 | 2½x3 | 1 |
| Up to 80 | 2½x3 | 2 |
| Up to 180 | 3 x3 | 2 |

## Steam Driven Air Compressors

**Furnished with Governor and all Accessories**

| Stats | Steam Cylinder | Air Cylinder | Stroke | Cu. Ft. Air Per Min. |
|---|---|---|---|---|
| Up to 35 | 3 | 3 | 3 | 2 |
| Up to 45 | 4 | 3 | 5 | 3.2 |
| Up to 60 | 4 | 4 | 5 | 5 |
| Up to 75 | 4 | 4 | 6 | 6.5 |
| Up to 90 | 5¼ | 4 | 7 | 7 |
| Up to 150 | 5 | 5 | 6 | 10 |
| Up to 200 | 4 | 6⅛ | 5 | 13 |
| Up to 225 | 5 | 6⅛ | 6 | 14 |
| Up to 300 | 5 | 7 | 6 | 20 |

## Tank Sizes

**For Electric and Steam Compressors**

Up to 50 Thermostats= 30 gal. tank
Up to 75 Thermostats= 60 gal. tank
Up to 200 Thermostats=100 gal. tank

# The B&B Line of Massachusetts Modified Squirrel Cage Fans

## Application and Uses

Massachusetts Modified Squirrel Cage Fans are especially adapted for heating and ventilating systems in schools, public buildings, factories and mills; the ventilation of mines, subways, tunnels, drying systems and on board of ship. This type of fan is used for all classes of work formerly done by the steel plate (or paddle-wheel) type, but is not designed for moving materials such as shavings, wool, or grain, etc. Squirrel cage fans are made in standard sizes and capacities to meet every requirement for mechanical draft and for ventilation, whether or not in connection with heating.

## Housing

The Housing is constructed of blue annealed open-hearth steel, strongly braced, bolted and riveted to a rigid frame of angle irons. The outlet is rectangular in shape and consists of angle irons bolted to the housing and arranged for connection to a discharge duct. The inlet is cone-shape and so constructed as to allow removal of the wheel from the housing.

## Wheel

The fan wheel is designed to combine rigid construction and great strength with entrance to the blades free from obstruction. The blades are formed in dies. The resulting uniformity of thickness and weight gives the close balance necessary to prevent deflection, distortion or vibration at high speeds. The blades are securely riveted at both ends to annular rings. A few of the blades are slightly deeper than the rest, and these are attached to radial steel arms which are cast into the hub. The heavy spider on which the wheel is built is the deal construction for rigidity, strength and balance.

## Shaft

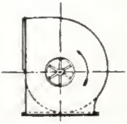
This is a steel forging or hot rolled carbon steel, depending upon the size, accurately turned and ground to size, keyseated for the hub of the wheel and for pulley or coupling.

## Bearings

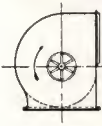
The bearings are extra long, of large diameters, self-oiling and self-aligning. They are of the ring-oiling type with large oil chambers. Bearings are lined with special babbitt metal accurately bored and reamed to size. For use under conditions requiring them, the bearings are water-cooled.

Squirrel Cage Fans can also be equipped with ball bearings or roller bearings to meet special conditions or specifications at a slight extra cost.

# Designation of Rotation and Discharge Massachusetts Modified Squirrel Cage Fans



Counter-Clockwise
Top Horizontal



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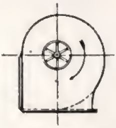
Top Horizontal



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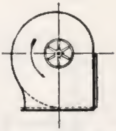
Bottom Horizontal



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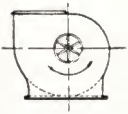
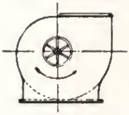
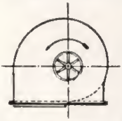
Bottom Horizontal



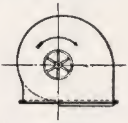
Clockwise
Up Blast



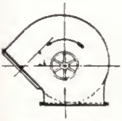
Counter-Clockwise
Up Blast



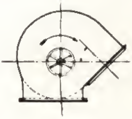
Counter-Clockwise
Down Blast



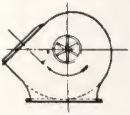
Clockwise
Down Blast



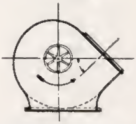
Counter-Clockwise
Top Angular Down



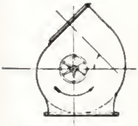
Clockwise
Top Angular Down



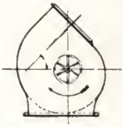
Clockwise
Bottom Angular Up



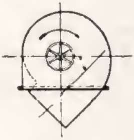
Counter-Clockwise
Bottom Angular Up



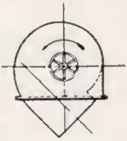
Counter-Clockwise
Top Angular Up



Clockwise
Top Angular Up



Clockwise
Bottom Angular Down



Counter-Clockwise
Bottom Angular Down

This method of designation applies to all centrifugal fans, single or double width, and single or double inlet.

Facing the driving side of a fan, blower or blast wheel if the proper direction of rotation is clockwise, the fan, blower or blast wheel will be designated as CLOCKWISE. If the proper direction of rotation is counter-clockwise the designation will be COUNTER-CLOCKWISE. (The driving side of a single inlet fan is considered to be the side opposite inlet regardless of the actual location of the drive).

The discharge of a fan is determined by the direction of the line of discharge and its relation to the fan shaft, as follows:

BOTTOM HORIZONTAL—If the line of discharge is horizontal and below the shaft.

TOP HORIZONTAL—If the line of discharge is horizontal and above the shaft.

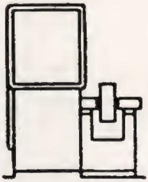
UP BLAST—If the line of air discharge is vertically up.

DOWN BLAST—If the line of air discharge is vertically down.

All intermediate discharge will be indicated as angular discharge as follows—Either top or bottom angular up discharge or top or bottom angular down discharge, the smallest angle made by the line of air discharge with the horizontal being specified. (See diagrams above.)

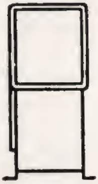
# The B&B Line of Massachusetts Modified Squirrel Cage Fans

## Standard Arrangements



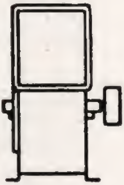
### Arrangement 1—For Belt Drive

Wheel overhung, includes housing, wheel shaft, two bearings, pedestal and pulley.



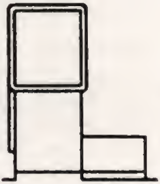
### Arrangement 2—Direct Connection

Wheel overhung, includes housing and wheel only.



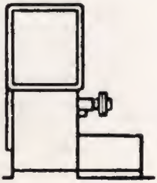
### Arrangement 3—For Belt Drive

Pulley overhung, includes housing, wheel, shaft, two bearings and pulley.



### Arrangement 4—For Direct Connection

Wheel overhung on engine or motor shaft, includes housing, wheel and base.



### Arrangement 5—Direct Connections

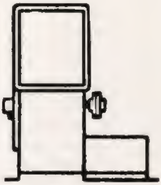
Includes housing, wheel, shaft, bearing on drive side of fan, flanged coupling and base.

# The B&B Line of Massachusetts Modified Squirrel Cage Fans

## Standard Arrangements

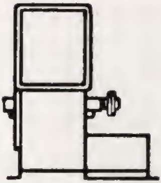
### Arrangement 6—Direct Connection

Includes housing, wheel, shaft, bearing in fan inlet, flanged coupling and base.



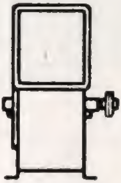
### Arrangement 7—Direct Connection

Includes housing, wheel, shaft, two bearings flexible coupling and base.



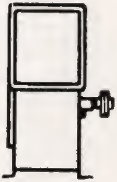
### Arrangement 8—Direct Connection

Includes housing, wheel, shaft, two bearings, and flexible coupling.



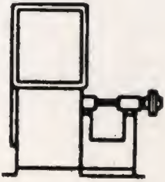
### Arrangement 9—Direct Connection

Wheel overhung, includes housing, wheel, shaft, one bearing on drive side and flanged coupling.



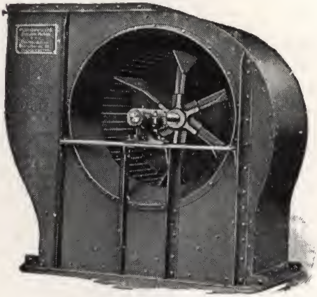
### Arrangement 10—Direct Connection

Wheel overhung, includes housing, wheel shaft, two bearings, pedestal and flexible coupling.



# The B&B Line of Massachusetts Modified Squirrel Cage Fans

The Modified Squirrel Cage Fan is made single width, single inlet, when it is used as an exhauster. When used as a blower, fans ranging from size No. 1½ and up can be equipped with two inlets with housing of single width. Fans with two inlets have a different characteristic from single inlet as the tip speed will average about 5% lower for a given volume and pressure.

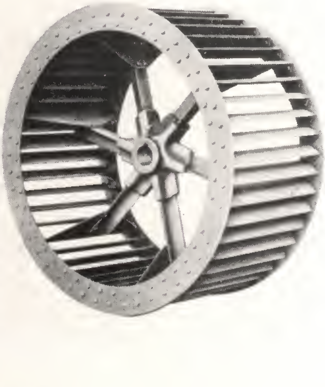


Single Width Squirrel Cage Fan

A double width, double inlet squirrel cage fan will deliver approximately twice the volume of air of a single width fan at the same pressure and tip speed, and require twice the power. This type of fan can be used to advantage particularly where head room is limited.

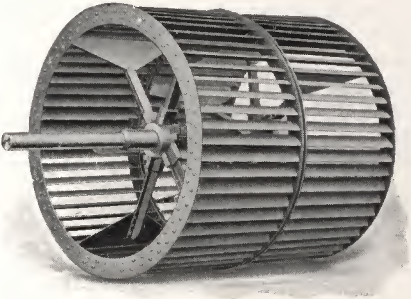
## Wheel

The fan wheel is designed to combine rigid construction and great strength with entrance to the blades free from obstruction. The blades are formed in dies. The resulting uniformity of thickness and weight gives the close balance necessary to prevent deflection, distortion or vibration at high speeds. The blades are securely riveted at both ends to annular rings. A few of the blades are slightly deeper than the rest, and these are attached to radial steel arms which are cast into the hub. The heavy spider on which the wheel is built is the ideal construction for rigidity, strength and balance.



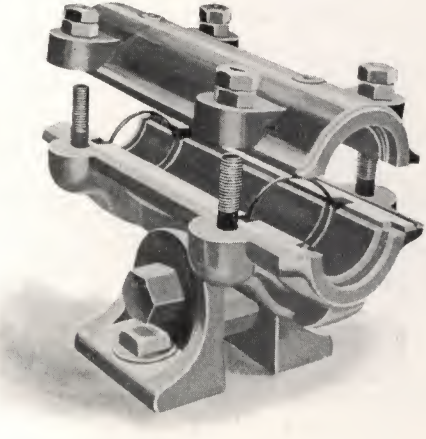
# The B&B Line of Massachusetts Modified Squirrel Cage Fans

The housings are built of open-hearth steel, of proper weight, rigidly braced and bolted and riveted to angle iron frames. Housings are of such proportion to give the highest efficiency in delivery of air.



**Fan Wheel for Double Width Fan**

The bearings are extra long and of large diameter, self-oiling and self-aligning. They are of the double ring oiling type and are provided with a large oil reservoir. The linings are of the best quality babbitt, accurately bored and reamed to size, and under special conditions, water cooling is provided for.



# The B&B Line of Massachusetts Modified Squirrel Cage Fans

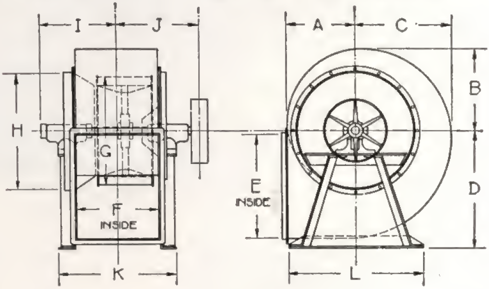
The universal type of fan has many advantages, as same can be adapted to either hand and a great number of discharges, being readily interchangeable by removing a series of bolts.

Up to size No. 3 inclusive, fans of the universal type will be furnished unless otherwise requested.

## Outline of Universal Type Fan

**Single Width No. 1½ to No. 3 inclusive—Single Inlet**

## Universal Squirrel Cage Fan—Arrangement "A"



| SIZE | A | B | C | D | E | F | G | H | I | J | K | L | Shaft Dia. | Pulley | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | Dia. | Face |
| 1½ | 11⅜ | 13⅝ | 15⅞ | 20¼ | 17⅝ | 13⅞ | 18 | 19 | 14⅜ | 15½ | 20½ | 23½ | 1 7/16 | 10 | 4 |
| 1¾ | 13⅜ | 16 | 18⅝ | 23½ | 20⅝ | 16⅛ | 21 | 23 | 15½ | 16¾ | 24⅝ | 27 | 1 7/16 | 12 | 4 |
| 2 | 15¼ | 18¼ | 21¼ | 26¼ | 23½ | 18½ | 24 | 26 | 17 | 18⅞ | 26⅝ | 32 | 1 11/16 | 14 | 4 |
| 2¼ | 17⅛ | 20½ | 23⅞ | 29¾ | 26½ | 20¾ | 27 | 29 | 19 | 21⅛ | 28⅞ | 38 | 1 15/16 | 16 | 4 |
| 2½ | 19 | 22¾ | 26½ | 32¾ | 29⅜ | 23⅛ | 30 | 32 | 20¼ | 21¾ | 33⅛ | 39 | 1 15/16 | 18 | 4 |
| 2¾ | 21 | 25⅛ | 29¼ | 35½ | 32⅜ | 25⅜ | 33 | 35 | 22 | 24 | 35⅜ | 44 | 2 3/16 | 20 | 6 |
| 3 | 22⅞ | 27⅜ | 31⅞ | 38½ | 35¼ | 27¾ | 36 | 38 | 23 | 25¼ | 37¾ | 44½ | 2 3/16 | 22 | 6 |

All dimensions are in inches.

Do not use these dimensions for construction purposes. Certified prints will be furnished upon application.

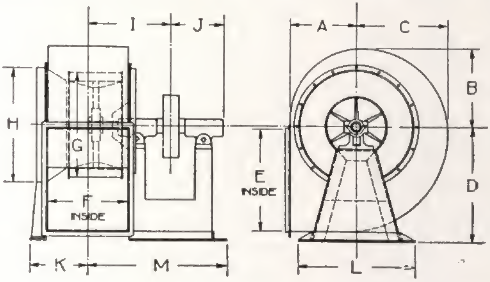
# The B&B Line of Massachusetts Modified Squirrel Cage Fans

Squirrel cage fans size No. 3½ and larger are made only in standard type. Single inlet fans are constructed with either pulley or overhung wheel. Single width fans can be furnished with double inlet.

## Outline of Universal Type Fan

**Single Width, No. 1½ to No. 3, inclusive, Single Inlet**

## Universal Squirrel Cage Fan—Arrangement "B"



| SIZE | A | B | C | D | E | F | G | H | I | J | K | L | M | Shaft Dia. | Pulley | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | Dia. | Face |
| 1¼ | 9½ | 11⅜ | 13¼ | 17⅛ | 14 11/16 | 11 9/16 | 15 | 16 | 14 3/16 | 9 9/16 | 8 | 20 | 24 3/16 | 1 5/16 | 8 | 4 |
| 1½ | 11⅜ | 13⅝ | 15⅞ | 20¼ | 17⅝ | 13⅞ | 18 | 19 | 16⅛ | 10⅞ | 9⅞ | 22½ | 27⅜ | 1 7/16 | 10 | 4 |
| 1¾ | 13⅜ | 16 | 18⅝ | 23½ | 20⅝ | 16⅛ | 21 | 23 | 17 5/16 | 10 15/16 | 11 | 24¼ | 28⅝ | 1 7/16 | 12 | 4 |
| 2 | 15¼ | 18¼ | 21¼ | 26¼ | 23½ | 18½ | 24 | 26 | 19 3/16 | 12¼ | 12 11/16 | 26⅝ | 31 11/16 | 1 11/16 | 14 | 4 |
| 2¼ | 17⅛ | 20½ | 23⅞ | 29¾ | 26½ | 20¾ | 27 | 29 | 21¼ | 13½ | 14 | 30¾ | 35⅝ | 1 15/16 | 16 | 4 |
| 2½ | 19 | 22¾ | 26½ | 32¾ | 29⅜ | 23⅛ | 30 | 32 | 22 7/16 | 13½ | 15 11/16 | 32¾ | 37 5/16 | 1 15/16 | 18 | 4 |
| 2¾ | 21 | 25⅛ | 29¼ | 35½ | 32⅜ | 25⅜ | 33 | 35 | 25 1/16 | 15½ | 16 13/16 | 35¼ | 41 3/16 | 2 3/16 | 20 | 6 |
| 3 | 22⅞ | 27⅜ | 31⅞ | 38½ | 35¼ | 27¾ | 36 | 38 | 26¾ | 15½ | 18 | 35⅝ | 43⅜ | 2 7/16 | 22 | 6 |

**All dimensions are in inches.**

Do not use these dimensions for construction purposes. Certified prints will be furnished upon application.

# The B&B Line of Massachusetts Modified Squirrel Cage Fans

## Capacities—Speeds—Horsepowers

Air at 65 degrees, Fahrenheit, Density being .075

| Size | Dia. Wheels Inches | Static Press. Inches W. G. | ⅛ | ¼ | ⅜ | ½ | ⅝ | ¾ |
|---|---|---|---|---|---|---|---|---|
| | | P. V. | 1200 | 1800 | 2100 | 2350 | 2700 | 2900 |
| 1½ | 18 | C.F.M. | 1470 | 2360 | 2640 | 2890 | 3370 | 3600 |
| | | R.P.M. | 256 | 381 | 445 | 499 | 573 | 616 |
| | | B.H.P. | .08 | .26 | .41 | .54 | .84 | 1.02 |
| 1¾ | 21 | C.F.M. | 2000 | 3210 | 3600 | 3940 | 4590 | 4900 |
| | | R.P.M. | 220 | 327 | 382 | 428 | 492 | 528 |
| | | B.H.P. | 10 | .36 | .56 | .74 | 1.15 | 1.39 |
| 2 | 24 | C.F.M. | 2610 | 4180 | 4700 | 5150 | 6000 | 6390 |
| | | R.P.M. | 192 | 286 | 334 | 374 | 430 | 462 |
| | | B.H.P. | .13 | .47 | .73 | .97 | 1.50 | 1.81 |
| 2¼ | 27 | C.F.M. | 3300 | 5300 | 5950 | 6510 | 7590 | 8100 |
| | | R.P.M. | 171 | 254 | 297 | 332 | 382 | 411 |
| | | B.H.P. | .17 | .59 | .92 | 1.22 | 1.90 | 2.30 |
| 2½ | 30 | C.F.M. | 4080 | 6550 | 7340 | 8050 | 9370 | 9990 |
| | | R.P.M. | 154 | 229 | 267 | 299 | 344 | 370 |
| | | B.H.P. | .21 | .73 | 1.13 | 1.51 | 2.35 | 2.84 |
| 2¾ | 33 | C.F.M. | 4930 | 7910 | 8880 | 9730 | 11350 | 12100 |
| | | R.P.M. | 140 | 208 | 243 | 272 | 313 | 336 |
| | | B.H.P. | .25 | .88 | 1.37 | 1.82 | 2.84 | 3.44 |
| 3 | 36 | C.F.M. | 5880 | 9420 | 10550 | 11600 | 13500 | 14400 |
| | | R.P.M. | 128 | 191 | 223 | 250 | 287 | 307 |
| | | B.H.P. | .30 | 1.05 | 1.63 | 2.17 | 3.38 | 4.10 |
| 3½ | 42 | C.F.M. | 8000 | 12800 | 14400 | 15800 | 18400 | 19600 |
| | | R.P.M. | 110 | 163 | 191 | 214 | 246 | 264 |
| | | B.H.P. | .41 | 1.43 | 2.22 | 2.96 | 4.60 | 5.57 |
| 4 | 48 | C.F.M. | 10450 | 16750 | 18800 | 20600 | 24000 | 25550 |
| | | R.P.M. | 96 | 143 | 167 | 187 | 215 | 231 |
| | | B.H.P. | .53 | 1.87 | 2.90 | 3.86 | 6.00 | 7.25 |
| 4½ | 54 | C.F.M. | 13200 | 21200 | 23800 | 26100 | 30400 | 32400 |
| | | R.P.M. | 85 | 127 | 148 | 166 | 191 | 205 |
| | | B.H.P. | .67 | 2.37 | 3.67 | 4.89 | 7.60 | 9.20 |
| 5 | 60 | C.F.M. | 16300 | 26200 | 29400 | 32200 | 37500 | 40000 |
| | | R.P.M. | 77 | 114 | 134 | 150 | 172 | 185 |
| | | B.H.P. | .83 | 2.93 | 4.54 | 6.04 | 9.38 | 11.4 |
| 5½ | 66 | C.F.M. | 19750 | 31700 | 35500 | 38900 | 45400 | 48300 |
| | | R.P.M. | 70 | 104 | 122 | 136 | 156 | 168 |
| | | B.H.P. | 1.00 | 3.54 | 5.48 | 7.29 | 11.3 | 13.7 |
| 6 | 72 | C.F.M. | 23500 | 37700 | 42300 | 46300 | 54000 | 57500 |
| | | R.P.M. | 64 | 95 | 111 | 125 | 143 | 154 |
| | | B.H.P. | 1.19 | 4.21 | 6.53 | 8.68 | 13.5 | 16.3 |
| 6½ | 78 | C.F.M. | 27600 | 44200 | 49600 | 54400 | 63400 | 67500 |
| | | R.P.M. | 59 | 88 | 103 | 115 | 132 | 142 |
| | | B.H.P. | 1.40 | 4.94 | 7.65 | 10.2 | 15.9 | 19.2 |
| 7 | 84 | C.F.M. | 32000 | 51300 | 57600 | 63000 | 73500 | 78300 |
| | | R.P.M. | 55 | 82 | 96 | 107 | 123 | 132 |
| | | B.H.P. | 1.62 | 5.73 | 8.89 | 11.9 | 18.4 | 22.3 |
| 7½ | 90 | C.F.M. | 36800 | 58900 | 66100 | 72500 | 84500 | 90000 |
| | | R.P.M. | 51 | 76 | 89 | 100 | 115 | 123 |
| | | B.H.P. | 1.86 | 6.58 | 10.2 | 13.6 | 21.1 | 25.6 |
| 8 | 96 | C.F.M. | 41800 | 67000 | 75100 | 82400 | 96000 | 102000 |
| | | R.P.M. | 48 | 72 | 84 | 94 | 108 | 116 |
| | | B.H.P. | 2.12 | 7.49 | 11.6 | 15.4 | 24.0 | 29.0 |

# The B&B Line of Massachusetts Modified Squirrel Cage Fans

## Capacities—Speeds—Horsepowers

**Air at 65 Degrees Fahrenheit, Density being .075**

| Size | Dia. Wheels Inches | Static Press. Inches W. G. | 1 | 1¼ | 1½ | 2 | 2½ |
|---|---|---|---|---|---|---|---|
| | | **P. V.** | 3300 | 3700 | 4100 | 4900 | 5300 |
| 1½ | 18 | C.F.M. | 3940 | 4480 | 5050 | 6230 | 6550 |
| | | R.P.M. | 701 | 787 | 870 | 1040 | 1125 |
| | | B.H.P. | 1.48 | 2.11 | 2.86 | 5.21 | 6.34 |
| 1¾ | 21 | C.F.M. | 5360 | 6100 | 6870 | 8470 | 8900 |
| | | R.P.M. | 601 | 675 | 746 | 892 | 964 |
| | | B.H.P. | 2.01 | 2.88 | 3.89 | 7.06 | 8.60 |
| 2 | 24 | C.F.M. | 7000 | 7950 | 9000 | 11100 | 11650 |
| | | R.P.M. | 526 | 590 | 652 | 780 | 844 |
| | | B.H.P. | 2.63 | 3.75 | 5.09 | 9.28 | 11.3 |
| 2¼ | 27 | C.F.M. | 8850 | 10100 | 11350 | 14000 | 14700 |
| | | R.P.M. | 468 | 524 | 580 | 694 | 750 |
| | | B.H.P. | 3.32 | 4.76 | 6.42 | 11.7 | 14.2 |
| 2½ | 30 | C.F.M. | 10900 | 12400 | 14050 | 17300 | 18200 |
| | | R.P.M. | 421 | 472 | 522 | 624 | 675 |
| | | B.H.P. | 4.09 | 5.85 | 7.95 | 14.5 | 17.6 |
| 2¾ | 33 | C.F.M. | 13200 | 15100 | 16900 | 20900 | 22000 |
| | | R.P.M. | 383 | 429 | 475 | 568 | 614 |
| | | B.H.P. | 4.96 | 7.11 | 9.56 | 17.5 | 21.3 |
| 3 | 36 | C.F.M. | 15750 | 17900 | 20200 | 24900 | 26200 |
| | | R.P.M. | 351 | 394 | 435 | 520 | 562 |
| | | B.H.P. | 5.91 | 8.43 | 11.4 | 20.8 | 25.3 |
| 3½ | 42 | C.F.M. | 21400 | 24400 | 27500 | 33900 | 35700 |
| | | R.P.M. | 301 | 337 | 372 | 446 | 482 |
| | | B.H.P. | 8.04 | 11.5 | 15.6 | 28.3 | 34.5 |
| 4 | 48 | C.F.M. | 28000 | 31850 | 35900 | 44250 | 46550 |
| | | R.P.M. | 263 | 295 | 326 | 390 | 422 |
| | | B.H.P. | 10.5 | 15.0 | 20.3 | 37.0 | 45.0 |
| 4½ | 54 | C.F.M. | 35400 | 40300 | 45500 | 56000 | 59000 |
| | | R.P.M. | 234 | 262 | 290 | 347 | 375 |
| | | B.H.P. | 13.3 | 19.0 | 25.7 | 46.8 | 57.1 |
| 5 | 60 | C,F.M. | 43700 | 49800 | 56100 | 69200 | 73000 |
| | | R.P.M. | 211 | 236 | 261 | 312 | 337 |
| | | B.H.P. | 16.4 | 23.4 | 31.7 | 57.9 | 70.6 |
| 5½ | 66 | C.F.M. | 53000 | 60500 | 68000 | 83800 | 88000 |
| | | R.P.M. | 191 | 214 | 237 | 284 | 307 |
| | | B.H.P. | 19.9 | 28.5 | 38.5 | 70.0 | 85.1 |
| 6 | 72 | C.F.M. | 63000 | 71800 | 80900 | 99600 | 105000 |
| | | R.P.M. | 175 | 197 | 217 | 260 | 281 |
| | | B.H.P. | 23.6 | 33.8 | 45.8 | 83.2 | 102.0 |
| 6½ | 78 | C.F.M. | 74000 | 84200 | 95000 | 117000 | 123000 |
| | | R.P.M. | 162 | 181 | 201 | 240 | 260 |
| | | B.H.P. | 27.8 | 39.6 | 53.7 | 98.0 | 119.0 |
| 7 | 84 | C.F.M. | 85900 | 97600 | 110000 | 135500 | 143000 |
| | | R.P.M. | 150 | 169 | 186 | 223 | 241 |
| | | B.H.P. | 32.3 | 46.0 | 63.6 | 113.0 | 138.0 |
| 7½ | 90 | C.F.M. | 98500 | 112000 | 126500 | 156000 | 164000 |
| | | R.P.M. | 140 | 157 | 174 | 208 | 225 |
| | | B.H.P. | 37.0 | 52.7 | 71.6 | 130.0 | 159.0 |
| 8 | 96 | C.F.M. | 112000 | 127500 | 143500 | 177000 | 187000 |
| | | R.P.M. | 132 | 148 | 163 | 195 | 211 |
| | | B.H.P. | 42.1 | 60.0 | 81.2 | 148.0 | 181.0 |

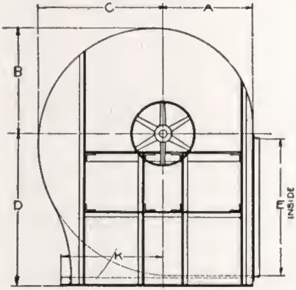
# The B&B Line of Massachusetts Modified Squirrel Cage Fans

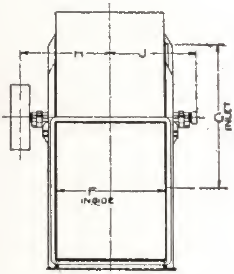
## Principal Dimensions

in Inches

### Full Housed Bottom Horizontal Discharge

**Single Width** **Single Inlet**





| Size | Shaft | Wheel | A | B | C | D | E | F | G | H | J | K | Pulley |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *1½ | 1$\frac{5}{16}$ | 18 | 11⅜ | 13⅝ | 15⅞ | 20⅝ | 17⅝ | 13⅞ | 19 | 14¾ | 13⅛ | 16¼ | 10x 4 |
| *1¾ | 1$\frac{7}{16}$ | 21 | 13⅜ | 16 | 18⅜ | 23¾ | 20⅝ | 16⅛ | 22 | 16½ | 14⅞ | 18⅝ | 12x 4 |
| *2 | 1$\frac{11}{16}$ | 24 | 15¼ | 18¼ | 21¼ | 26¾ | 23½ | 18½ | 26 | 18¼ | 16⅝ | 20¼ | 14x 4 |
| *2¼ | 1$\frac{15}{16}$ | 27 | 17⅛ | 20½ | 23⅞ | 29¾ | 26½ | 20¾ | 29 | 20½ | 19 | 21¾ | 16x 4 |
| *2½ | 1$\frac{15}{16}$ | 30 | 19 | 22¾ | 26½ | 32¾ | 29⅜ | 23⅛ | 32 | 21¼ | 20¼ | 23¼ | 18x 4 |
| *2¾ | 2$\frac{3}{16}$ | 33 | 21 | 25⅛ | 29¼ | 35⅞ | 32⅜ | 25⅜ | 35 | 24½ | 21⅞ | 25¼ | 20x 6 |
| *3 | 2$\frac{3}{16}$ | 36 | 22⅞ | 27⅜ | 31⅞ | 39⅜ | 35¼ | 27¾ | 38 | 25⅝ | 23 | 27¼ | 22x 6 |
| 3½ | 2$\frac{7}{16}$ | 42 | 26¾ | 32 | 37¼ | 45½ | 41⅛ | 32⅜ | 44 | 28½ | 25⅞ | 30¾ | 24x 6 |
| 4 | 2$\frac{11}{16}$ | 48 | 30½ | 36½ | 42½ | 52 | 47 | 37 | 50 | 31⅞ | 29¼ | 34¼ | 28x 6 |
| 4½ | 2$\frac{15}{16}$ | 54 | 34¼ | 41 | 47¾ | 58 | 52⅞ | 41⅝ | 56 | 34⅞ | 32¼ | 37¼ | 30x 6 |
| 5 | 3$\frac{3}{16}$ | 60 | 38⅛ | 45⅝ | 53⅛ | 64⅛ | 58¾ | 46¼ | 62 | 38¾ | 35⅝ | 42¾ | 36x 8 |
| 5½ | 3$\frac{7}{16}$ | 66 | 42 | 50¼ | 58½ | 70¼ | 64⅝ | 50⅞ | 68 | 41⅞ | 38¾ | 45¾ | 40x 8 |
| 6 | 3$\frac{15}{16}$ | 72 | 45¾ | 54¾ | 63¾ | 76¼ | 70½ | 55½ | 74 | 45⅞ | 41¾ | 48¾ | 44x 8 |
| 6½ | 4$\frac{7}{16}$ | 78 | 49½ | 59¼ | 69 | 82¼ | 76⅜ | 60⅛ | 80 | 50 | 47¼ | 52¼ | 48x 8 |
| 7 | 4$\frac{15}{16}$ | 84 | 53⅜ | 63⅞ | 74⅜ | 89⅜ | 82¼ | 64¾ | 86 | 54½ | 51½ | 56¼ | 52x10 |
| 7½ | 4$\frac{15}{16}$ | 90 | 57¼ | 68½ | 79¾ | 95½ | 88⅛ | 69⅜ | 92 | 56⅞ | 53⅞ | 59¼ | 56x10 |
| 8 | 5½ | 96 | 61 | 73 | 85 | 101½ | 94 | 74 | 98 | 60⅞ | 58⅛ | 62¼ | 60x10 |

Do not use these dimensions for construction purposes. Certified prints will be furnished upon application.

*No. 1½ to No. 3, inclusive, are regularly built Universal type, but can be built to suit requirements.

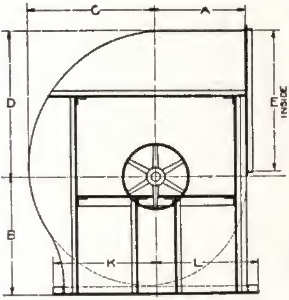
# The B&B Line of Massachusetts Modified Squirrel Cage Fans

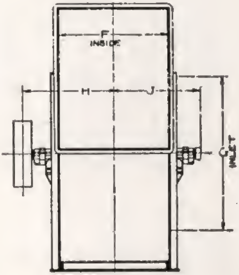
## Principal Dimensions

### in Inches

## Full Housed Top Horizontal Discharge

**Single Width** **Single Inlet**





| Size | Shaft | Wheel | A | B | C | D | E | F | G | H | J | K | L | Pulley |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *1½ | 1 5/16 | 18 | 11⅜ | 16⅛ | 15⅞ | 18⅛ | 17⅝ | 13⅞ | 19 | 14¾ | 13⅛ | 16¾ | 11⅜ | 10x 4 |
| *1¾ | 1 7/16 | 21 | 13⅜ | 18½ | 18⅝ | 21¼ | 20⅝ | 16⅛ | 22 | 16½ | 14⅞ | 18¼ | 13⅜ | 12x 4 |
| *2 | 1 11/16 | 24 | 15¼ | 20¾ | 21¼ | 24¼ | 23½ | 18½ | 26 | 18¼ | 16⅝ | 20¼ | 18⅜ | 14x 4 |
| *2¼ | 1 15/16 | 27 | 17⅛ | 23 | 23⅞ | 27¼ | 26½ | 20¾ | 29 | 20½ | 19 | 21¾ | 20¼ | 16x 4 |
| *2½ | 1 15/16 | 30 | 19 | 25¼ | 26½ | 30¼ | 29⅜ | 23⅛ | 32 | 21¼ | 20¼ | 23¼ | 22⅛ | 18x 4 |
| *2¾ | 2 3/16 | 33 | 21 | 27⅝ | 29¼ | 33⅜ | 32⅜ | 25⅜ | 35 | 24½ | 21⅞ | 25¼ | 24⅛ | 20x 6 |
| *3 | 2 3/16 | 36 | 22⅞ | 30⅜ | 31⅞ | 36⅜ | 35¼ | 27¾ | 38 | 25⅝ | 23 | 27¼ | 26½ | 22x 6 |
| 3½ | 2 7/16 | 42 | 26¾ | 35 | 37¼ | 42½ | 41⅛ | 32⅜ | 44 | 28½ | 25⅞ | 30¾ | 30⅜ | 24x 6 |
| 4 | 2 11/16 | 48 | 30½ | 40 | 42½ | 48½ | 47 | 37 | 50 | 31⅞ | 29¼ | 34¼ | 34⅝ | 28x 6 |
| 4½ | 2 15/16 | 54 | 34¼ | 44½ | 47¾ | 54½ | 52⅞ | 41⅝ | 56 | 34⅞ | 32¼ | 37¼ | 38⅜ | 30x 6 |
| 5 | 3 3/16 | 60 | 38⅛ | 49⅛ | 53⅛ | 60⅝ | 58¾ | 46¼ | 62 | 38¾ | 35⅝ | 42¾ | 43¼ | 36x 8 |
| 5½ | 3 7/16 | 66 | 42 | 53¾ | 58½ | 66¾ | 64⅝ | 50⅞ | 68 | 41⅞ | 38¾ | 45¾ | 47⅛ | 40x 8 |
| 6 | 3 15/16 | 72 | 45¾ | 58¼ | 63¾ | 72¾ | 70½ | 55½ | 74 | 45⅞ | 41¾ | 48¾ | 50⅞ | 44x 8 |
| 6½ | 4 7/16 | 78 | 49½ | 62¾ | 69 | 78¾ | 76⅜ | 60⅛ | 80 | 50 | 47¼ | 52¼ | 54⅝ | 48x10 |
| 7 | 4 15/16 | 84 | 53⅜ | 68⅜ | 74⅜ | 84⅞ | 82¼ | 64¾ | 86 | 54½ | 51½ | 56¼ | 59½ | 52x10 |
| 7½ | 4 15/16 | 90 | 57¼ | 73 | 79¾ | 91 | 88⅛ | 69⅜ | 92 | 56⅞ | 53⅞ | 59¼ | 63⅜ | 56x10 |
| 8 | 5½ | 96 | 61 | 77½ | 85 | 97 | 94 | 74 | 98 | 60⅞ | 58⅛ | 62¼ | 67⅛ | 60x10 |

Do not use these dimensions for construction purposes. Certified prints will be furnished upon application.

*No. 1½ to No. 3, inclusive, are regularly built Universal type, but can be built to suit requirements.

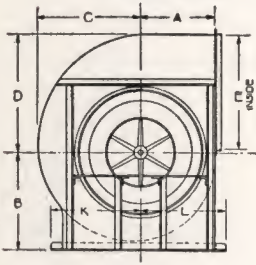
# The B&B Line of Massachusetts Modified Squirrel Cage Fans

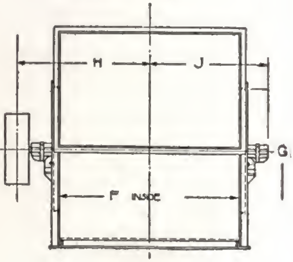
## Principal Dimensions

in Inches

### Full Housed Top Horizontal Discharge

**Double Width** **Double Inlet**





| SIZE | Shaft at Center | Size of Bearing | Wheel | A | B | C | D | E | F | G | H | J | K | L | Pulley |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1½ | 1 11/16 | 1 7/16 | 18 | 11⅜ | 16⅛ | 15⅞ | 18⅛ | 17⅝ | 27¾ | 19 | 22 | 19¼ | 16¾ | 14 | 10x 6 |
| 1¾ | 1 15/16 | 1 7/16 | 21 | 13⅜ | 18½ | 18⅝ | 21¼ | 20⅝ | 32¼ | 23 | 25 | 21½ | 18¼ | 16 | 12x 6 |
| 2 | 2 3/16 | 1 11/16 | 24 | 15¼ | 20¾ | 21¼ | 24¼ | 23½ | 37 | 26 | 28 | 24½ | 20¼ | 18⅜ | 14x 6 |
| 2¼ | 2 7/16 | 1 15/16 | 27 | 17⅛ | 23 | 23⅞ | 27¼ | 26½ | 41½ | 29 | 31½ | 28 | 21¾ | 20¼ | 16x 6 |
| 2½ | 2 7/16 | 1 15/16 | 30 | 19 | 25¼ | 26½ | 30¼ | 29⅜ | 46¼ | 32 | 34 | 30¼ | 23¼ | 22⅛ | 18x 6 |
| 2¾ | 2 11/16 | 2 3/16 | 33 | 21 | 27⅝ | 29¼ | 33⅜ | 32⅜ | 50¾ | 35 | 38 | 33 | 25¼ | 24⅛ | 20x 8 |
| 3 | 2 15/16 | 2 3/16 | 36 | 22⅞ | 30⅜ | 31⅞ | 36⅜ | 35¼ | 55½ | 38 | 40¼ | 35½ | 27¼ | 26½ | 22x 8 |
| 3½ | 3 3/16 | 2 7/16 | 42 | 26¾ | 35 | 37¼ | 42½ | 41⅛ | 64¾ | 44 | 45½ | 40½ | 30¾ | 30⅜ | 24x 8 |
| 4 | 3 7/16 | 2 11/16 | 48 | 30½ | 39½ | 42½ | 48½ | 47 | 74 | 50 | 51¼ | 46¼ | 34¼ | 34⅛ | 28x 8 |
| 4½ | 3 15/16 | 2 15/16 | 54 | 34¼ | 44 | 47¾ | 54½ | 52⅞ | 83¼ | 56 | 56½ | 51½ | 37¼ | 37⅞ | 30x 8 |
| 5 | 4 7/16 | 3 3/16 | 60 | 38⅛ | 49⅛ | 53⅛ | 60⅝ | 58¾ | 92½ | 62 | 63¼ | 57¼ | 42¾ | 42¼ | 36x10 |
| 5½ | 4 15/16 | 3 7/16 | 66 | 42 | 53¾ | 58½ | 66¾ | 64⅝ | 101¾ | 68 | 68½ | 62½ | 45¾ | 46⅛ | 40x10 |
| 6 | 5½ | 3 15/16 | 72 | 45¾ | 58¼ | 63¾ | 72¾ | 70½ | 111 | 74 | 74¾ | 69 | 48¾ | 50⅞ | 44x10 |
| 6½ | 6 | 4 7/16 | 78 | 49½ | 62¾ | 69 | 78¾ | 76⅜ | 120¼ | 80 | 81¼ | 75¼ | 52¼ | 54⅝ | 48x10 |
| 7 | 6¾ | 4 15/16 | 84 | 53⅜ | 67⅜ | 74⅜ | 84⅞ | 82¼ | 129½ | 86 | 87⅞ | 81⅝ | 56¼ | 59½ | 52x12 |
| 7½ | 7½ | 4 15/16 | 90 | 57¼ | 72 | 79¾ | 91 | 88⅛ | 138¾ | 92 | 92½ | 86¼ | 59¼ | 63⅜ | 56x12 |
| 8 | 8 | 5½ | 96 | 61 | 77½ | 85 | 97 | 94 | 148 | 98 | 98⅞ | 92⅞ | 62¼ | 67⅛ | 60x12 |

Do not use these dimensions for construction purposes. Certified prints will be furnished upon application.

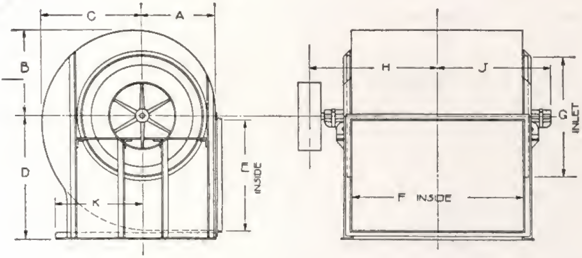
# The B&B Line of Massachusetts Modified Squirrel Cage Fans

## Principal Dimensions

in Inches

### Full Housed Bottom Horizontal Discharge

**Double Width** **Double Inlet**



| SIZE | Shaft at Center | Size of Bearing | Wheel | A | B | C | D | E | F | G | H | J | K | Pulley |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1½ | 1 11/16 | 1 7/16 | 18 | 11⅜ | 13⅝ | 15⅞ | 20⅝ | 17⅝ | 27¾ | 19 | 22 | 19¼ | 16¾ | 10x 6 |
| 1¾ | 1 15/16 | 1 7/16 | 21 | 13⅜ | 16 | 18⅝ | 23¾ | 20⅝ | 32¼ | 23 | 25 | 21½ | 18¼ | 12x 6 |
| 2 | 2 3/16 | 1 11/16 | 24 | 15¼ | 18¼ | 21¼ | 26¾ | 23½ | 37 | 26 | 28 | 24½ | 20¼ | 14x 6 |
| 2¼ | 2 7/16 | 1 15/16 | 27 | 17⅛ | 20½ | 23⅞ | 29¾ | 26½ | 41½ | 29 | 31½ | 28 | 21¾ | 16x 6 |
| 2½ | 2 7/16 | 1 15/16 | 30 | 19 | 22¾ | 26½ | 32¾ | 29⅜ | 46¼ | 32 | 34 | 30¼ | 23¼ | 18x 6 |
| 2¾ | 2 11/16 | 2 3/16 | 33 | 21 | 25⅛ | 29¼ | 35⅞ | 32⅜ | 50¾ | 35 | 38 | 33 | 25¼ | 20x 8 |
| 3 | 2 15/16 | 2 3/16 | 36 | 22⅞ | 27⅜ | 31⅞ | 39⅜ | 35¼ | 55½ | 38 | 40¼ | 35½ | 27¼ | 22x 8 |
| 3½ | 3 3/16 | 2 7/16 | 42 | 26¾ | 32 | 37¼ | 45½ | 41⅛ | 64¾ | 44 | 45½ | 40½ | 30¾ | 24x 8 |
| 4 | 3 7/16 | 2 11/16 | 48 | 30½ | 36½ | 42½ | 51½ | 47 | 74 | 50 | 51¼ | 46¼ | 34¼ | 28x 8 |
| 4½ | 3 15/16 | 2 15/16 | 54 | 34¼ | 41 | 47¾ | 57½ | 52⅞ | 83¼ | 56 | 56½ | 51½ | 37¼ | 30x 8 |
| 5 | 4 7/16 | 3 3/16 | 60 | 38⅛ | 45⅝ | 53⅛ | 64⅛ | 58¾ | 92½ | 62 | 63¼ | 57¼ | 42¾ | 36x10 |
| 5½ | 4 15/16 | 3 7/16 | 66 | 42 | 50¼ | 58½ | 70¼ | 64⅝ | 101¾ | 68 | 68½ | 62½ | 45¾ | 40x10 |
| 6 | 5½ | 3 15/16 | 72 | 45¾ | 54¾ | 63¾ | 76¼ | 70½ | 111 | 74 | 74¾ | 69 | 48¾ | 44x10 |
| 6½ | 6 | 4 7/16 | 78 | 49½ | 59¼ | 69 | 82¼ | 76⅜ | 120¼ | 80 | 81¼ | 75¼ | 52¼ | 48x10 |
| 7 | 6¾ | 4 15/16 | 84 | 53⅜ | 63⅞ | 74⅜ | 89⅜ | 82¼ | 129½ | 86 | 87⅞ | 81⅝ | 56¼ | 52x12 |
| 7½ | 7½ | 4 15/16 | 90 | 57¼ | 68½ | 79¾ | 95½ | 88⅛ | 138¾ | 92 | 92½ | 86¼ | 59¼ | 56x12 |
| 8 | 8 | 5½ | 96 | 61 | 73 | 85 | 101½ | 94 | 148 | 98 | 98⅞ | 92⅞ | 62¼ | 60x12 |

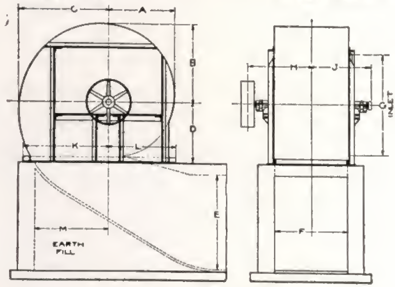
Do not use these dimensions for construction purposes. Certified prints will be furnished upon application.

# The B&B Line of Massachusetts Modified Squirrel Cage Fans

## Principal Dimensions
in Inches

## 7-8 Housed Bottom Horizontal Discharge

**Single Width** **Single Inlet**



| SIZE | Shaft | Wheel | A | B | C | D | E | F | G | H | J | K | L | M | Pulley |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1½ | 1 5/16 | 18 | 12⅛ | 14⅜ | 16⅝ | 12⅜ | 17⅝ | 13⅜ | 19 | 14¾ | 13⅛ | 16¾ | 16 | 13¾ | 10x 4 |
| 1¾ | 1 7/16 | 21 | 14¼ | 16⅞ | 19½ | 14⅛ | 20⅝ | 15⅝ | 22 | 16½ | 14⅞ | 19¼ | 17½ | 16⅛ | 12x 4 |
| 2 | 1 11/16 | 24 | 16¼ | 19¼ | 22¼ | 15¾ | 23½ | 18 | 26 | 18¼ | 16⅝ | 24½ | 20½ | 18⅜ | 14x 4 |
| 2¼ | 1 15/16 | 27 | 18¼ | 21⅝ | 25 | 17⅜ | 26½ | 20¼ | 29 | 20½ | 19 | 25½ | 22 | 20½ | 16x 4 |
| 2½ | 1 15/16 | 30 | 20¼ | 24 | 27¾ | 19 | 29⅜ | 22⅝ | 32 | 21¼ | 20¼ | 26⅞ | 23 | 23 | 18x 4 |
| 2¾ | 2 3/16 | 33 | 22⅜ | 26½ | 30⅝ | 20¾ | 32⅜ | 24⅞ | 35 | 24½ | 21⅞ | 29⅜ | 25 | 25¼ | 20x 6 |
| 3 | 2 3/16 | 36 | 24⅜ | 28⅞ | 33⅜ | 22⅞ | 35¼ | 27¼ | 38 | 25⅝ | 23 | 32¼ | 27 | 27½ | 22x 6 |
| 3½ | 2 7/16 | 42 | 28¼ | 33¾ | 39 | 26¼ | 41⅛ | 31⅞ | 44 | 28½ | 25⅞ | 37⅛ | 30½ | 32⅛ | 24x 6 |
| 4 | 2 11/16 | 48 | 32½ | 38½ | 44½ | 29⅞ | 47 | 36⅜ | 50 | 31⅞ | 29¼ | 42 | 34 | 36⅝ | 28x 6 |
| 4½ | 2 15/16 | 54 | 36¾ | 43⅛ | 49⅞ | 33¼ | 52⅞ | 41 | 56 | 34⅞ | 32¼ | 47⅛ | 37 | 41¼ | 30x 6 |
| 5 | 3 3/16 | 60 | 40½ | 48 | 55½ | 36½ | 58¾ | 45½ | 62 | 38¾ | 35⅝ | 53⅛ | 42½ | 45⅞ | 36x 8 |
| 5½ | 3 7/16 | 66 | 44⅝ | 52⅞ | 61⅛ | 39⅞ | 64⅝ | 50⅛ | 68 | 41⅞ | 38¾ | 58 | 45½ | 50⅜ | 40x 8 |
| 6 | 3 15/16 | 72 | 48⅝ | 57⅝ | 66⅝ | 43⅛ | 70½ | 54¾ | 74 | 45⅞ | 41¾ | 62⅝ | 48½ | 55 | 44x 8 |
| 6½ | 4 7/16 | 78 | 52⅝ | 62⅜ | 72⅛ | 46⅜ | 76⅜ | 59⅜ | 80 | 50 | 47¼ | 67½ | 52 | 59½ | 48x 8 |
| 7 | 4 15/16 | 84 | 56¾ | 67¼ | 77¾ | 50¾ | 82¼ | 64 | 86 | 54½ | 51½ | 73⅜ | 56 | 64¼ | 52x10 |
| 7½ | 4 15/16 | 90 | 60⅞ | 72⅛ | 83⅜ | 54⅛ | 88⅛ | 68⅝ | 92 | 56⅞ | 53⅞ | 78⅛ | 59 | 68¾ | 56x10 |
| 8 | 5½ | 96 | 64⅞ | 76⅞ | 88⅞ | 57⅜ | 94 | 73¼ | 98 | 60⅞ | 58⅛ | 83 | 62 | 73¼ | 60x10 |

Do not use these dimensions for construction purposes. Certified prints will be furnished upon application.

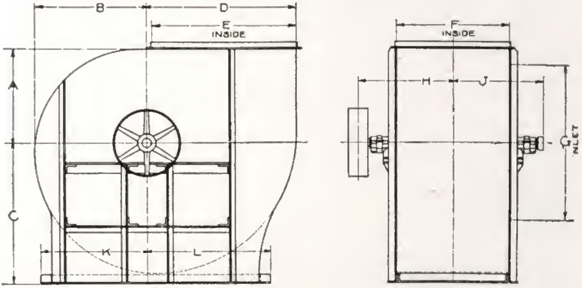
# The B&B Line of Massachusetts Modified Squirrel Cage Fans

## Principal Dimensions

in Inches

### Full Housed Top Vertical Discharge

**Single Width** **Single Inlet**



| SIZE | Shaft | Wheel | A | B | C | D | E | F | G | H | J | K | L | Pulley |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *1½ | 1 5/16 | 18 | 11⅜ | 13⅝ | 18⅜ | 18⅛ | 17⅝ | 13⅞ | 19 | 14¾ | 13⅛ | 16¾ | 16¼ | 10x 4 |
| *1¾ | 1 7/16 | 21 | 13⅜ | 16 | 21⅛ | 21¼ | 20⅝ | 16⅛ | 22 | 16½ | 14⅞ | 18¼ | 18⅝ | 12x 4 |
| *2 | 1 11/16 | 24 | 15¼ | 18¼ | 23¾ | 24¼ | 23½ | 18½ | 26 | 18¼ | 16⅝ | 20¼ | 23½ | 14x 4 |
| *2¼ | 1 13/16 | 27 | 17⅛ | 20½ | 26⅜ | 27¼ | 26½ | 20¾ | 29 | 20½ | 19 | 21¾ | 24 | 16x 4 |
| *2½ | 1 15/16 | 30 | 19 | 22¾ | 29 | 30¼ | 29⅜ | 23⅛ | 32 | 21¼ | 20¼ | 23¼ | 27 | 18x 4 |
| *2¾ | 2 3/16 | 33 | 21 | 25⅛ | 31¾ | 33⅜ | 32⅜ | 25⅜ | 35 | 24½ | 21⅞ | 25¼ | 28 | 20x 6 |
| *3 | 2 3/16 | 36 | 22⅞ | 27⅜ | 34⅞ | 36⅜ | 35¼ | 27¾ | 38 | 25⅝ | 23 | 27¼ | 30 | 22x 6 |
| 3½ | 2 7/16 | 42 | 26¾ | 32 | 40¼ | 42½ | 41⅛ | 32⅜ | 44 | 28½ | 25⅞ | 30¾ | 34¾ | 24x 6 |
| 4 | 2 11/16 | 48 | 30½ | 36½ | 46 | 48½ | 47 | 37 | 50 | 31⅞ | 29¼ | 34¼ | 40¼ | 28x 6 |
| 4½ | 2 15/16 | 54 | 34¼ | 41 | 51¼ | 54½ | 52⅞ | 41⅝ | 56 | 34⅞ | 32¼ | 37¼ | 44¼ | 30x 6 |
| 5 | 3 3/16 | 60 | 38⅛ | 45⅝ | 56⅝ | 60⅝ | 58¾ | 46¼ | 62 | 38¾ | 35⅝ | 42¾ | 49 | 36x 8 |
| 5½ | 3 7/16 | 66 | 42 | 50¼ | 62 | 66¾ | 64⅝ | 50⅞ | 68 | 41⅞ | 38¾ | 45¾ | 52¾ | 40x 8 |
| 6 | 3 15/16 | 72 | 45¾ | 54¾ | 67¼ | 72¾ | 70½ | 55½ | 74 | 45⅞ | 41¾ | 48¾ | 57 | 44x 8 |
| 6½ | 4 7/16 | 78 | 49½ | 59¼ | 72½ | 78¾ | 76⅜ | 60⅛ | 80 | 50 | 47¼ | 52¼ | 61¾ | 48x 8 |
| 7 | 4 15/16 | 84 | 53⅜ | 63⅞ | 78⅞ | 84⅞ | 82¼ | 64¾ | 86 | 54½ | 51½ | 56¼ | 67½ | 52x10 |
| 7½ | 4 15/16 | 90 | 57¼ | 68½ | 84¼ | 91 | 88⅛ | 69⅜ | 92 | 56⅞ | 53⅞ | 59¼ | 71¾ | 56x10 |
| 8 | 5½ | 96 | 61 | 73 | 89½ | 97 | 94 | 74 | 98 | 60⅞ | 58⅛ | 62¼ | 75¾ | 60x10 |

Do not use these dimensions for construction purposes. Certified prints will be furnished upon application.

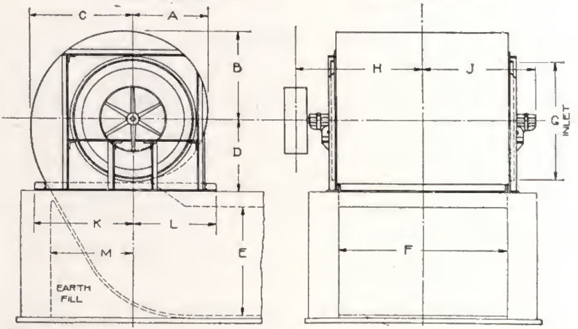
*No. 1½ to No. 3, inclusive, are regularly built Universal type, but can be built to suit requirements.

# The B&B Line of Massachusetts Modified Squirrel Cage Fans

## Principal Dimensions
in Inches

## 7-8 Housed Bottom Horizontal Discharge

**Double Width** **Double Inlet**



| SIZE | Shaft at Center | Size of Bearing | Wheel | A | B | C | D | E | F | G | H | J | K | L | M | Pulley |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1½ | 1 11/16 | 1 7/16 | 18 | 12⅛ | 14⅜ | 16⅝ | 12⅜ | 17⅝ | 27¾ | 19 | 22 | 19¼ | 16¾ | 16 | 13¾ | 10x 6 |
| 1¾ | 1 15/16 | 1 7/16 | 21 | 14¼ | 16⅞ | 19½ | 14⅛ | 20⅝ | 32¼ | 23 | 25 | 21½ | 19¼ | 17½ | 16⅛ | 12x 6 |
| 2 | 2 3/16 | 1 11/16 | 24 | 16¼ | 19¼ | 22¼ | 15¾ | 23½ | 37 | 26 | 28 | 24½ | 24½ | 20½ | 18⅜ | 14x 6 |
| 2¼ | 2 7/16 | 1 15/16 | 27 | 18¼ | 21⅝ | 25 | 17⅜ | 26½ | 41½ | 29 | 31½ | 28 | 25½ | 22 | 20½ | 16x 6 |
| 2½ | 2 7/16 | 1 15/16 | 30 | 20¼ | 24 | 27¾ | 19 | 29⅜ | 46¼ | 32 | 34 | 30¼ | 26⅞ | 23 | 23 | 18x 6 |
| 2¾ | 2 11/16 | 2 3/16 | 33 | 22⅜ | 26½ | 30⅝ | 20¾ | 32⅜ | 50¾ | 35 | 38 | 33 | 29⅜ | 25 | 25¼ | 20x 8 |
| 3 | 2 15/16 | 2 3/16 | 36 | 24⅜ | 28⅞ | 33⅜ | 22⅞ | 35¼ | 55½ | 38 | 40¼ | 35½ | 32¼ | 27 | 27½ | 22x 8 |
| 3½ | 3 3/16 | 2 7/16 | 42 | 28¼ | 33¾ | 39 | 26¼ | 41⅛ | 64¾ | 44 | 45½ | 40½ | 37⅛ | 30½ | 32⅛ | 24x 8 |
| 4 | 3 7/16 | 2 11/16 | 48 | 32½ | 38½ | 44½ | 29⅞ | 47 | 74 | 50 | 51¼ | 46¼ | 42 | 34 | 36⅝ | 28x 8 |
| 4½ | 3 15/16 | 2 15/16 | 54 | 36¾ | 43⅛ | 49⅞ | 33¼ | 52⅞ | 83¼ | 56 | 56½ | 51½ | 47⅛ | 37 | 41¼ | 30x 8 |
| 5 | 4 7/16 | 3 3/16 | 60 | 40½ | 48 | 55½ | 36½ | 58¾ | 92½ | 62 | 63¼ | 57¼ | 53⅛ | 42½ | 45⅞ | 36x10 |
| 5½ | 4 15/16 | 3 7/16 | 66 | 44⅝ | 52⅞ | 61⅛ | 39⅞ | 64⅝ | 101¾ | 68 | 68½ | 62½ | 58 | 45½ | 50⅜ | 40x10 |
| 6 | 5½ | 3 15/16 | 72 | 48⅝ | 57⅝ | 66⅝ | 43⅛ | 70½ | 111 | 74 | 74¾ | 69 | 62⅝ | 48½ | 55 | 44x10 |
| 6½ | 6 | 4 7/16 | 78 | 52⅝ | 62⅜ | 72⅛ | 46⅜ | 76⅜ | 120¼ | 80 | 81¼ | 75¼ | 67½ | 52 | 59½ | 48x10 |
| 7 | 6¾ | 4 15/16 | 84 | 56¾ | 67¼ | 77¾ | 50¾ | 82¼ | 129½ | 86 | 87⅞ | 81⅝ | 73⅜ | 56 | 64¼ | 52x12 |
| 7½ | 7½ | 4 15/16 | 90 | 60⅞ | 72⅛ | 83⅜ | 54⅛ | 88⅛ | 138¾ | 92 | 92½ | 86¼ | 78⅛ | 59 | 68¾ | 56x12 |
| 8 | 8 | 5½ | 96 | 64⅞ | 76⅞ | 88⅞ | 57⅜ | 94 | 148 | 98 | 98⅞ | 92⅞ | 83 | 62 | 73¼ | 60x12 |

Do not use these dimensions for construction purposes. Certified prints will be furnished upon application.

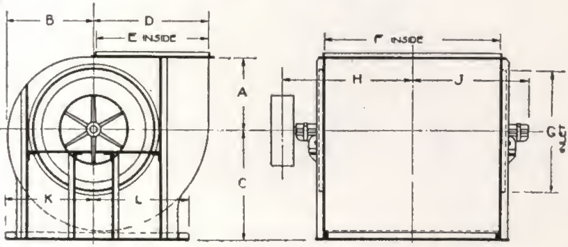
# The B&B Line of Massachusetts Modified Squirrel Cage Fans

## Principal Dimensions

in Inches

## Full Housed Top Vertical Discharge

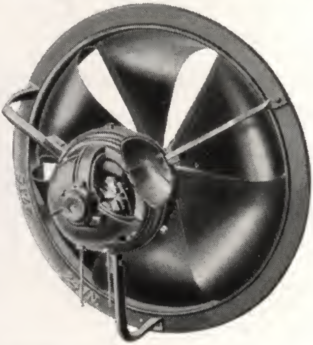
**Double Width** **Double Inlet**



| SIZE | Shaft at Center | Size of Bearing | Wheel | A | B | C | D | E | F | G | H | J | K | L | Pulley |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1½ | 1 11/16 | 1 7/16 | 18 | 11⅜ | 13⅝ | 18⅜ | 18⅛ | 17⅝ | 27¾ | 19 | 22 | 19¼ | 16¾ | 16¼ | 10x 6 |
| 1¾ | 1 15/16 | 1 7/16 | 21 | 13⅜ | 16 | 21⅛ | 21¼ | 20⅝ | 32¼ | 23 | 25 | 21½ | 18¼ | 18⅝ | 12x 6 |
| 2 | 2 3/16 | 1 11/16 | 24 | 15¼ | 18¼ | 23¾ | 24¼ | 23½ | 37 | 26 | 28 | 24½ | 20¼ | 23½ | 14x 6 |
| 2¼ | 2 7/16 | 1 15/16 | 27 | 17⅛ | 20½ | 26⅜ | 27¼ | 26½ | 41½ | 29 | 31½ | 28 | 21¾ | 24 | 16x 6 |
| 2½ | 2 7/16 | 1 15/16 | 30 | 19 | 22¾ | 29 | 30¼ | 29⅜ | 46¼ | 32 | 34 | 30¼ | 23¼ | 25 | 18x 6 |
| 2¾ | 2 11/16 | 2 3/16 | 33 | 21 | 25⅛ | 31¾ | 33⅜ | 32⅜ | 50¾ | 35 | 38 | 33 | 25¼ | 28 | 20x 8 |
| 3 | 2 15/16 | 2 3/16 | 36 | 22⅞ | 27⅜ | 34⅞ | 36⅜ | 35¼ | 55½ | 38 | 40¼ | 35½ | 27¼ | 30 | 22x 8 |
| 3½ | 3 3/16 | 2 7/16 | 42 | 26¾ | 32 | 40¼ | 42½ | 41⅛ | 64¾ | 44 | 45½ | 40½ | 30¾ | 34¾ | 24x 8 |
| 4 | 3 7/16 | 2 11/16 | 48 | 30½ | 36½ | 45½ | 48½ | 47 | 74 | 50 | 51¼ | 46¼ | 34¼ | 42¾ | 28x 8 |
| 4½ | 3 15/16 | 2 15/16 | 54 | 34¼ | 41 | 50¾ | 54½ | 52⅞ | 83¼ | 56 | 56½ | 51½ | 37¼ | 44 | 30x 8 |
| 5 | 4 7/16 | 3 3/16 | 60 | 38⅛ | 45⅝ | 56⅝ | 60⅝ | 58¾ | 92½ | 62 | 63¼ | 57¼ | 42¾ | 49 | 36x10 |
| 5½ | 4 15/16 | 3 7/16 | 66 | 42 | 50¼ | 62 | 66¾ | 64⅝ | 101¾ | 68 | 68½ | 62½ | 45¾ | 52¾ | 40x10 |
| 6 | 5½ | 3 15/16 | 72 | 45¾ | 54¾ | 67¼ | 72¾ | 70½ | 111 | 74 | 74¾ | 69 | 48¾ | 57 | 44x10 |
| 6½ | 6 | 4 7/16 | 78 | 49½ | 59¼ | 72½ | 78¾ | 76⅜ | 120¼ | 80 | 81¼ | 75¼ | 52¼ | 61¾ | 48x10 |
| 7 | 6¾ | 4 15/16 | 84 | 53⅜ | 63⅞ | 78⅞ | 84⅞ | 82¼ | 129½ | 86 | 87⅞ | 81⅝ | 56¼ | 67½ | 52x12 |
| 7½ | 7½ | 4 15/16 | 90 | 57¼ | 68½ | 84¼ | 91 | 88⅛ | 138¾ | 92 | 92½ | 86¼ | 59¼ | 71¾ | 56x12 |
| 8 | 8 | 5½ | 96 | 61 | 73 | 89½ | 97 | 94 | 148 | 98 | 98⅞ | 92⅞ | 62¼ | 75¾ | 60x12 |

Do not use these dimensions for construction purposes. Certified prints will be furnished upon application.

## MASSACHUSETTS PROPELLER FAN TYPE "R"



**Illustrating Accessibility to Brushes and Inspection of Motor**

This shows one of the inspection covers opened for commutator and brush inspection; they are closed thereafter for protection to motor, thus preventing moisture or sediment from entering the windings when fan is in operation.

All direct current motors are equipped with hinged inspection covers and protective type brush holders for commutator protection.

**Bearings** on all Direct Current Propeller Fans up to and including 48-inch size are wool-packed. Extra high-grade carded wool is securely packed around bearing sleeve. These bearings insure ample lubrication and maintain, at all times, a thin film of oil between shaft and bearing sleeve. Frequent oiling is unnecessary. Oil rings and their danger of sticking are eliminated.

D. C. Fans, 54-inch and larger, are of ball bearing design.

**Brush-Holders** on Direct Current Motor Fans 16 inches and above are of the improved box-type and possess many advantages, such as noiseless operation; maximum current capacity, insuring non-heating operation in either direction of rotation; pig-tail connections, eliminating all sliding contact difficulties; adjustable tension. Holder allows brush to wear at the same degree of angle throughout the life of brush.

**Special acid-resistance metal is used in the construction of fan-wheels for all fans handling acids. We recommend their use and can furnish them at small additional cost above standard wheels.**

### Alternating Current Propeller Fans

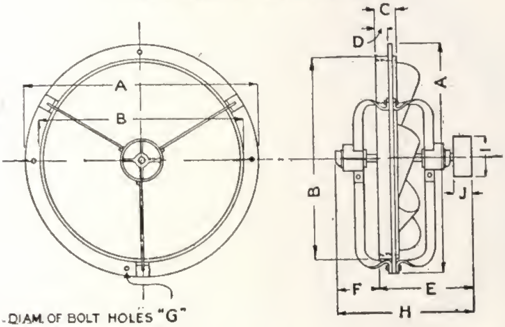
The very latest ideas on improved propeller fan construction are embodied in the wonderful mechanical perfection of these fans. The motors are of the protected type, provision being made for easy accessibility and inspection of working parts within motor by removal of hand-hole cover. The motor windings are protected against dirt, grease or other foreign substances from entering therein.

**Bearings** on all Fans up to and including 48-inch size are wool-packed. Extra high-grade carded wool is securely packed around bearing sleeve. These bearings insure ample lubrication and maintain, at all times, a thin film of oil between shaft and bearing sleeve. Frequent oiling is unnecessary. Oil rings and their danger of sticking are eliminated.

**Shafts** in all Motors are of extremely large size in diameter, accurately ground, embodying special treatment.

**Rotors** in all Multiphase Motors are of the indestructible type and design and are accurately machined and balanced.

# PULLEY DRIVEN TYPE PROPELLER FANS



## Dimensions—Inches

| SIZE INCHES | A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|---|
| 18 | 21½ | 19 | 1⅜ | 1 | 12½ | 8 | 5/16 | 20½ | 4 | 2 |
| 20 | 24 | 21 | 2 | 1⅛ | 12½ | 8 | ⅜ | 20½ | 5 | 2 |
| 24 | 28½ | 25½ | 2 | 1⅛ | 14½ | 8¼ | ⅜ | 22¾ | 5 | 2 |
| 30 | 35 | 31 | 2⅜ | 1¼ | 14½ | 8¼ | ⅝ | 22¾ | 6 | 3 |
| 36 | 42½ | 38 | 2⅝ | 1⅜ | 14½ | 8¼ | ⅝ | 22¾ | 6 | 3 |
| 42 | 49 | 44½ | 3 | 1⅞ | 16 | 9 | ⅝ | 25 | 7 | 4 |
| 48 | 55½ | 50 | 3½ | 2 | 18 | 10 | ¾ | 28 | 8 | 5 |
| 54 | 61 | 56 | 4 | 2½ | 19 | 10 | ¾ | 29 | 10 | 5 |
| 60 | 68 | 63 | 4 | 2½ | 22 | 12 | ¾ | 34 | 10 | 5 |
| 72 | 81 | 74 | 5 | 3 | 22 | 14 | 1. | 36 | 12 | 6 |

NOTE — CERTIFIED DIMENSION PRINTS ISSUED ON APPLICATION. —

## PERFORMANCE DATA

| CODE WORD | Size Fan | Normal R.P.M. | Air Per Min. | H.P. Req'd | Pulley Dia. | Pulley Face | Approx Shp'g Weight |
|---|---|---|---|---|---|---|---|
| Vinlid | **18″** | 1050 | 2100 | ⅙ | 4″ | 2″ | **70** |
| Vinloo | **20″** | 950 | 2900 | ¼ | 5″ | 2″ | **88** |
| Vinley | **24″** | 850 | 4400 | ½ | 5″ | 2″ | **125** |
| Vinment | **30″** | 690 | 7500 | ¾ | 6″ | 2½″ | **190** |
| Vinmod | **36″** | 600 | 10000 | 1.0 | 6″ | 3″ | **275** |
| Vinnoss | **42″** | 500 | 13500 | 1.5 | 7″ | 4″ | **390** |
| Vinody | **48″** | 450 | 18000 | 2.0 | 8″ | 5″ | **550** |
| Vinoe | **54″** | 425 | 24000 | 3.0 | 10″ | 5″ | **700** |
| Vinoff | **60″** | 375 | 27500 | 3.5 | 10″ | 5″ | **850** |
| Vintage | **72″** | 300 | 38000 | 4.5 | 12″ | 6″ | **1050** |

Air deliveries based on restrictive tests.

PULLEYS on all horizontal fans are of steel split crown face design. Vertical fans are equipped with either groove or double flange pulleys; special sizes cost extra.

## EXHAUST FANS—PROPELLER TYPE—DIRECTLY CONNECTED
## TYPE R

Speed Regulators are furnished with all D. C. Fans 20-in. "B" and larger, giving approximately 50% speed reduction below normal by intermediate steps. A starting regulator only is furnished with 18-in. "A" and "B" Fans. These regulators serve to vary the speed when full capacity of fans is not required.

**Direct Current Fans and Performance Tables**

| CODE WORD | Size Type | Cu. Ft. Air per Min. | Watts Cons. per Hour | Revolutions per Min. | Approx. Ship'g Wt. |
|---|---|---|---|---|---|
| Wall | 12″“A” | 500 | 60 | 1200 | 60 |
| Wold | 12″“B” | 700 | 65 | 1700 | 60 |
| Whirl | 16″“B” | 1500 | 95 | 1250 | 65 |
| Was | 18″“A” | 2100 | 115 | 1050 | 80 |
| Wise | 18″“B” | 2500 | 165 | 1160 | 80 |
| Waist | 20″“B” | 2900 | 210 | 950 | 140 |
| Wet | 24″“A” | 4200 | 284 | 830 | 200 |
| Wander | 24″“B” | 4600 | 425 | 900 | 225 |
| Win | 30″“A” | 7500 | 458 | 690 | 250 |
| Wizard | 30″“B” | 9000 | 500 | 825 | 350 |
| Wipe | 36″“A” | 10000 | 575 | 600 | 420 |
| Warp | 36″“B” | 12000 | 780 | 725 | 525 |
| Will | 42″“B” | 13500 | 875 | 500 | 600 |
| Went | 48″“B” | 18500 | 1330 | 460 | 700 |
| Ward | 54″“B” | 23000 | 1720 | 410 | 1025 |
| Weed | 60″“B” | 27500 | 2325 | 375 | 1400 |
| Wade | 72″“B” | 36000 | 2900 | 275 | 2300 |

**Alternating Current Fans—Constant Speed—Single Phase—60 Cycles**

| | | | | | |
|---|---|---|---|---|---|
| Quer | 12″“A” | 500 | 55 | 1160 | 60 |
| Quell | 12″“B” | 700 | 65 | 1700 | 60 |
| Quop | 16″“A” | 1200 | 80 | 860 | 60 |
| Quipe | 16″“B” | 1500 | 90 | 1160 | 60 |
| Quire | 18″“A” | 1800 | 105 | 860 | 80 |
| Quad | 18″“B” | 2500 | 165 | 1160 | 80 |
| Quan | 20″“A” | 2600 | 180 | 860 | 100 |
| Quaint | 20″“B” | 3300 | 195 | 1160 | 100 |
| Quail | 24″“A” | 3500 | 235 | 690 | 180 |
| Quit | 24″“B” | 4400 | 285 | 860 | 180 |
| Quart | 30″“B” | 6500 | 465 | 690 | 260 |

Type "B" Fans only are manufactured for vertical operation.

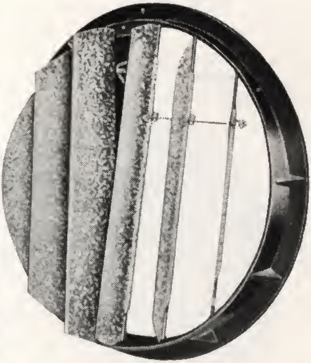
**MULTIPHASE—60 CYCLES**

| | | | | | |
|---|---|---|---|---|---|
| Pin | 18″“B” | 2500 | 175 | 1160 | 80 |
| Pipe | 20″“A” | 2600 | 180 | 860 | 110 |
| Post | 20″“B” | 3300 | 195 | 1160 | 110 |
| Put | 24″“A” | 3500 | 235 | 690 | 160 |
| Pay | 24″“B” | 4400 | 285 | 860 | 160 |
| Pass | 30″“A” | 6200 | 325 | 570 | 230 |
| Pent | 30″“B” | 7500 | 465 | 690 | 230 |
| Purr | 36″“A” | 8400 | 530 | 495 | 450 |
| Pill | 36″“B” | 9800 | 615 | 575 | 450 |
| Pine | 42″“B” | 13300 | 830 | 495 | 600 |
| Prank | 48″“B” | 19400 | 1415 | 495 | 650 |
| Pond | 54″“B” | 24000 | 1740 | 425 | 1000 |
| Pard | 60″“B” | 28000 | 2140 | 380 | 1300 |
| Pearl | 72″“B” | 38200 | 2840 | 285 | 1500 |

Type "A" Fans not furnished for vertical operation.
Alternating current motors above are wound for constant speed.

*(When ordering specify cycle, phase and voltage.)*

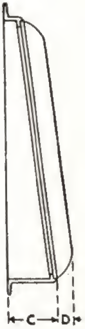
# Louvres

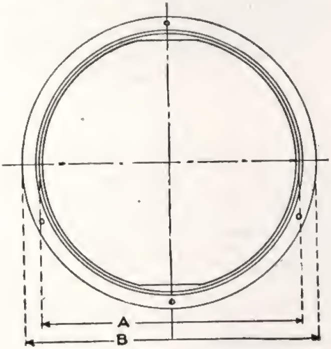


(*Patented*)

**All working parts of Louvres** are constructed of brass, the pivot rods also being of brass, which eliminates rust or corrosion within working bearings. A double brass arm is provided of which each vane or blade is connected in series thereto and upon oscillation of one of the vanes a corresponding oscillating movement is imparted to each of the other vanes.

**Louvres** are especially designed to prevent back draft and provide weather protection to fan openings when the fan is not running. They consist of a number of semi-circular vanes connected together in series; these vanes are pivoted slantingly with respect to a vertical plane and are incined to drop into a closing position without exerting an excessive resistance against their opening movement caused by air directed against them from the opposite side.

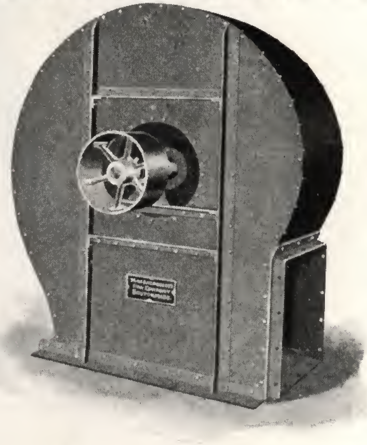




| Code Word | No. | A | B | C | D | Shipping Wt. |
|---|---|---|---|---|---|---|
| Reabe | 12 | 12¼ | 14¼ | 2½ | 2 | 20 |
| Reafy | 16 | 16½ | 18⅞ | 3½ | 3¾ | 27 |
| Reahs | 18 | 19 | 21⅞ | 3¾ | 4¼ | 38 |
| Realt | 20 | 21½ | 24⅜ | 4 | 4¾ | 48 |
| Reamk | 24 | 25½ | 29 | 4½ | 5½ | 65 |
| Reang | 30 | 31½ | 35 | 5 | 6¼ | 80 |
| Reasz | 36 | 39 | 42½ | 5½ | 6½ | 95 |
| Ready | 42 | 44 | 49½ | 6 | 7 | 110 |
| Reap | 48 | 50 | 56 | 6½ | 8 | 130 |
| Reach | 54 | 57 | 61½ | 7½ | 9 | 160 |
| Reek | 60 | 64 | 68½ | 8½ | 10 | 205 |
| Renck | 72 | 76 | 81 | 10 | 12 | 300 |

# The B&B Line of Massachusetts Steel Plate Fans

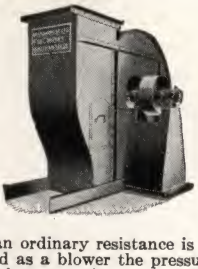
The Massachusetts Steel Plate Fan is the old standard type of centrifugal fan, sometimes known as the paddle wheel type. This type of fan is commonly used in connection with extended systems of ducts, and thus is of great service in heating and ventilation of public buildings, office buildings, factories, etc. In such service the resistance to be overcome is high. In mechanical draft work where air velocities are high, this type of fan is of exceptional service, and well adapted to it.

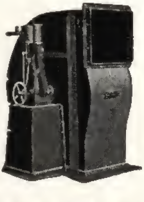


**Full Housed Bottom Horizontal Discharge**

The Massachusetts Steel Plate Fan is designed for large capacity rather than for high mechanical efficiency. The multiblade type of fan, such as the Massachusetts Squirrel Cage type, on the other hand is designed for high mechanical efficiencies. Both types have their applications and uses, and for certain types of service the steel plate fan is far superior to the multiblade type. These services are in the main as follows:

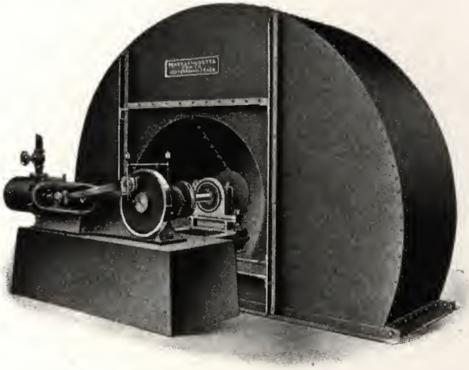
For mechanical draft in combination with a very thick fuel bed more than ordinary resistance is encountered, and if a multiblade fan were used as a blower the pressure developed would drop off and the capacity in proportion. A steel plate fan on the other hand under such conditions would permit the pressure to increase and adapt itself to variable conditions and resistance.





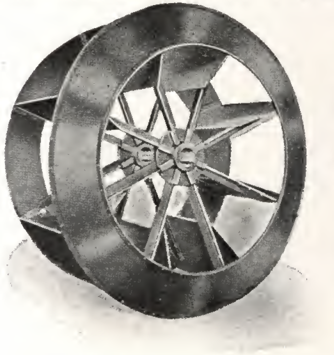
# The B&B Line of Massachusetts Steel Plate Fans

Because of the inherent property of steel plate fans in adapting itself to working pressures, it is of great service in process work where it may be desirable to operate the fan during certain periods at an underload and still maintain a definite pressure.



**Steel Plate Fan. Engine Driven**

The spiders of these fan wheels are steel tees cast into iron hubs. The wheel is stiffened with heavy steel bar rings and balanced, insuring freedom from vibration or straining under working pressure. For extra heavy duty, special wheels are furnished with heavy I-beam arms and extra strong bracing. The housing is built of heavy steel plate bolted and riveted to large steel angles, making a completely rigid structure. Larger sizes than those listed are built to meet particular requirements. Fans are furnished either right or left hand with top, bottom, vertical or angular discharges in full and three-quarter housings, direct or belt drive, from motor or engine.

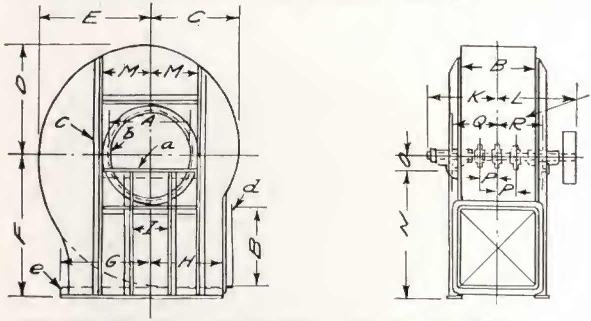


Standard design is with straight floats, but for certain classes of ventilation work the blades may be slightly curved backwards at the tips. Doing so reduces eddy air currents at the back of the float, reduces vibration and eliminates noise.

# The B&B Line of Massachusetts Steel Plate Fans

## Dimensions

### Full housed—Bottom horizontal discharge



| Size Fan | A | B | C | D | E | F | G | H | I | Pulley Size | Shaft Dia. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | 16½ | 15 | 16 | 18 | 20 | 24½ | 16 | 15 | 9 | 12x 4 | 1 7/16 |
| 50 | 21 | 18 | 19¾ | 22¼ | 24¾ | 29¾ | 20 | 18 | 9 | 13x 4 | 1 11/16 |
| 60 | 25 | 21½ | 23½ | 26½ | 29½ | 35 | 24 | 21 | 10 | 14x 4 | 1 15/16 |
| 70 | 27 | 25 | 27¼ | 30¾ | 34¼ | 40¾ | 28 | 24½ | 10 | 16x 4 | 2 3/16 |
| 80 | 30½ | 27 | 31 | 35 | 39 | 46 | 32 | 26½ | 10 | 18x 4 | 2 7/16 |
| 90 | 34½ | 31 | 34¾ | 39¼ | 43¾ | 51¼ | 35 | 30¼ | 10 | 20x 5 | 2 7/16 |
| 100 | 38 | 34 | 38½ | 43½ | 48½ | 57 | 38 | 32¾ | 13 | 22x 6 | 2 11/16 |
| 110 | 42 | 37½ | 42¼ | 47¾ | 53¼ | 62¼ | 42 | 35¾ | 13 | 24x 6 | 2 11/16 |
| 120 | 46 | 41 | 46 | 52 | 58 | 67½ | 46 | 39½ | 13 | 26x 6 | 2 15/16 |
| 130 | 49½ | 44 | 49¾ | 56¼ | 62¾ | 72¾ | 50 | 42¼ | 13 | 28x 6 | 2 15/16 |
| 140 | 53½ | 48 | 53½ | 60½ | 67½ | 78 | 53 | 45½ | 14 | 30x 7 | 3 3/16 |
| 160 | 60 | 54 | 61 | 69 | 77 | 88½ | 60 | 51½ | 14 | 32x 8 | 3 7/16 |
| 180 | 68 | 60 | 68½ | 77½ | 86½ | 100 | 67 | 57½ | 14 | 36x 8 | 3 7/16 |
| 200 | 76 | 66 | 76 | 86 | 96 | 110½ | 74 | 63½ | 15 | 40x10 | 3 15/16 |
| 220 | 84 | 72 | 83½ | 94½ | 105½ | 121 | 82 | 69½ |  | 44x12 | 4 7/16 |
| 240 | 92 | 78 | 91 | 103 | 115 | 131½ | 90 | 76¼ |  | 46x14 | 4 15/16 |

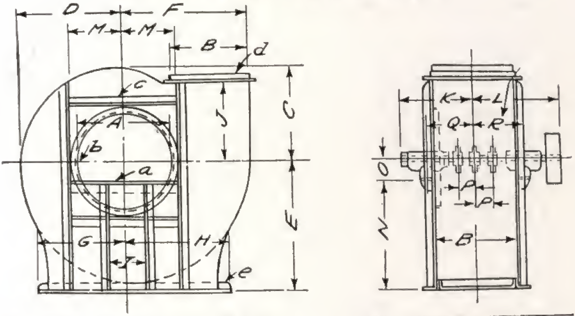
| Size Fan | K | L | M | N | O | P | Q | R | Pulley Size | Shaft Dia. |
|---|---|---|---|---|---|---|---|---|---|---|
| 40 | 14⅝ | 17⅞ | 9¾ | 20⅛ | 4⅜ | Only 1 Spider | 9 5/16 | 9⅛ | 12x 4 | 1 7/16 |
| 50 | 16¾ | 20 | 12 | 25⅛ | 4⅝ |  | 10 13/16 | 10⅝ | 13x 4 | 1 11/16 |
| 60 | 19¾ | 22⅞ | 14 | 29⅜ | 5⅝ |  | 13 1/16 | 12⅞ | 14x 4 | 1 15/16 |
| 70 | 22 | 25⅛ | 15 | 35 | 5¾ |  | 14 13/16 | 14⅝ | 16x 4 | 2 3/16 |
| 80 | 23½ | 26⅝ | 16¾ | 39 15/16 | 6 1/16 |  | 15 13/16 | 15⅝ | 18x 4 | 2 7/16 |
| 90 | 25½ | 29⅝ | 18¾ | 45 3/16 | 6 1/16 |  | 17 13/16 | 17⅝ | 20x 5 | 2 7/16 |
| 100 | 28⅛ | 33¼ | 20½ | 50 1/16 | 6 15/16 |  | 19 13/16 | 19⅝ | 22x 6 | 2 11/16 |
| 110 | 29⅞ | 35 | 22½ | 55 5/16 | 6 15/16 | 9 | 21 9/16 | 21⅜ | 24x 6 | 2 11/16 |
| 120 | 32¼ | 37⅜ | 24¾ | 60 7/16 | 7 1/16 | 9¾ | 23 5/16 | 23⅛ | 26x 6 | 2 15/16 |
| 130 | 33¾ | 38⅞ | 26½ | 65 11/16 | 7 1/16 | 10½ | 24 15/16 | 24⅝ | 28x 6 | 2 15/16 |
| 140 | 36⅞ | 42⅞ | 28½ | 70¼ | 7¾ | 11½ | 27 5/16 | 27⅛ | 30x 7 | 3 3/16 |
| 160 | 40⅝ | 47⅝ | 31¾ | 80⅝ | 7⅞ | 13 | 30 5/16 | 30⅛ | 32x 8 | 3 7/16 |
| 180 | 43⅝ | 50⅝ | 36¼ | 92⅛ | 7⅞ | 14 | 33 5/16 | 33⅛ | 36x 8 | 3 7/16 |
| 200 | 48⅜ | 57⅜ | 40¼ | 101¼ | 9¼ | 16 | 36 15/16 | 36⅝ | 40x10 | 3 15/16 |
| 220 | 53½ | 64⅛ | 44¼ | 111 | 10 | 17½ | 40 5/16 | 40⅛ | 44x12 | 4 7/16 |
| 240 |  |  | 48¼ |  |  | 19 |  |  | 46x14 | 4 15/16 |

Use Dimension R in above table on pulley side of single inlet fans only. Foundations to be of size and depth required by the soil.

# The B&B Line of Massachusetts Steel Plate Fans

## Dimensions

### Full housed—Top vertical discharge



| Size Fan | A | B | C | D | E | F | G | H | I | Pulley Size | Shaft Dia. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | 16½ | 15 | 16 | 18 | 22½ | 22 | 15½ | 18 | 9 | 12x 4 | 1 7/16 |
| 50 | 21 | 18 | 19¾ | 22¼ | 27¼ | 27¼ | 19 | 22 | 9 | 13x 4 | 1 11/16 |
| 60 | 25 | 21½ | 23½ | 26½ | 32 | 32½ | 22½ | 26 | 10 | 14x 4 | 1 15/16 |
| 70 | 27 | 25 | 27¼ | 30¾ | 37¼ | 37¾ | 26½ | 30½ | 10 | 16x 4 | 2 3/16 |
| 80 | 30½ | 27 | 31 | 35 | 42 | 43 | 30 | 34½ | 10 | 18x 4 | 2 7/16 |
| 90 | 34½ | 31 | 34¾ | 39¼ | 46¾ | 48¼ | 33½ | 39 | 10 | 20x 5 | 2 7/16 |
| 100 | 38 | 34 | 38½ | 43½ | 52 | 53½ | 37 | 43 | 13 | 22x 6 | 2 11/16 |
| 110 | 42 | 37½ | 42¼ | 47¾ | 56¾ | 58¾ | 41 | 47 | 13 | 24x 6 | 2 11/16 |
| 120 | 46 | 41 | 46 | 52 | 61½ | 64 | 44½ | 51½ | 13 | 26x 6 | 2 15/16 |
| 130 | 49½ | 44 | 49¾ | 56¼ | 66¼ | 69¼ | 48 | 55½ | 13 | 28x 6 | 2 15/16 |
| 140 | 53½ | 48 | 53½ | 60½ | 71 | 74½ | 51½ | 60 | 14 | 30x 7 | 3 3/16 |
| 160 | 60 | 54 | 61 | 69 | 80½ | 85 | 59 | 68 | 14 | 32x 8 | 3 7/16 |
| 180 | 68 | 60 | 68½ | 77½ | 91 | 95½ | 66 | 76½ | 14 | 36x 8 | 3 7/16 |
| 200 | 76 | 66 | 76 | 86 | 100½ | 106 | 73½ | 86 | 15 | 40x10 | 3 15/16 |
| 220 | 84 | 72 | 83½ | 94½ | 110 | 116½ | 80½ | 93 |  | 44x12 | 4 7/16 |
| 240 | 92 | 78 | 91 | 103 | 119½ | 127 | 87½ | 103 |  | 46x14 | 4 15/16 |

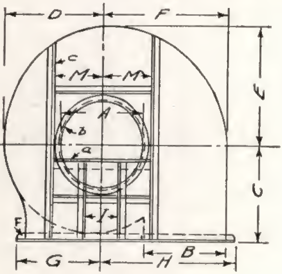
| Size Fan | J | K | L | M | N | O | P | Q | R | Pulley Size | Shaft Dia. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | 15 | 14⅝ | 17⅞ | 9¾ | 18⅛ | 4⅜ | Only 1 Spider | 9 5/16 | 9⅛ | 12x 4 | 1 7/16 |
| 50 | 18 | 16¾ | 20 | 12 | 22⅝ | 4⅝ |  | 10 13/16 | 10⅝ | 13x 4 | 1 11/16 |
| 60 | 21 | 19¾ | 22⅞ | 14 | 26⅜ | 5⅝ |  | 13 1/16 | 12⅞ | 14x 4 | 1 15/16 |
| 70 | 24½ | 22 | 25⅛ | 15 | 31½ | 5¾ |  | 14 13/16 | 14⅝ | 16x 4 | 2 3/16 |
| 80 | 26½ | 23½ | 26⅝ | 16¾ | 35 15/16 | 6 1/16 |  | 15 13/16 | 15⅝ | 18x 4 | 2 7/16 |
| 90 | 30¼ | 25½ | 29⅝ | 18¾ | 40 11/16 | 6 1/16 |  | 17 13/16 | 17⅝ | 20x 5 | 2 7/16 |
| 100 | 32¾ | 28⅛ | 33¼ | 20½ | 45 1/16 | 6 15/16 |  | 19 13/16 | 19⅝ | 22x 6 | 2 11/16 |
| 110 | 35¾ | 29⅞ | 35 | 22½ | 49 13/16 | 6 15/16 | 9 | 21 9/16 | 21⅜ | 24x 6 | 2 11/16 |
| 120 | 39½ | 32¼ | 37⅜ | 24¾ | 54 7/16 | 7 1/16 | 9¾ | 23 5/16 | 23⅛ | 26x 6 | 2 15/16 |
| 130 | 42¼ | 33¾ | 38⅞ | 26½ | 59 3/16 | 7 1/16 | 10½ | 24 13/16 | 24⅝ | 28x 6 | 2 15/16 |
| 140 | 45½ | 36⅞ | 42⅞ | 28½ | 63¼ | 7¾ | 11½ | 27 5/16 | 27⅛ | 30x 7 | 3 3/16 |
| 160 | 51½ | 40⅝ | 47⅝ | 31¾ | 72⅝ | 7⅞ | 13 | 30 5/16 | 30⅛ | 32x 8 | 3 7/16 |
| 180 | 57½ | 43⅝ | 50⅝ | 36¼ | 83⅛ | 7⅞ | 14 | 33 5/16 | 33⅛ | 36x 8 | 3 7/16 |
| 200 | 63½ | 48⅜ | 57⅜ | 40¼ | 91¼ | 9¼ | 16 | 36 13/16 | 36⅝ | 40x10 | 3 15/16 |
| 220 | 69½ | 53½ | 64⅛ | 44¼ | 100 | 10 | 17½ | 40 5/16 | 40⅛ | 44x12 | 4 7/16 |
| 240 | 76¼ |  |  | 48¼ |  |  | 19 |  |  | 46x14 | 4 15/16 |

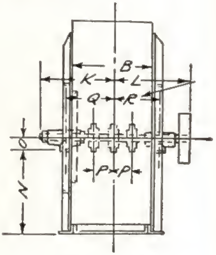
Use Dimension R in above table on pulley side of single inlet fans only. Foundations to be of size and depth required by the soil.

# The B&B Line of Massachusetts Steel Plate Fans

## Dimensions

### Full housed—Bottom vertical discharge





| Size Fan | A | B | C | D | E | F | G | H | I | Pulley Size | Shaft Dia. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | 16½ | 15 | 18½ | 18 | 20 | 22 | 15½ | 25 | 9 | 12x 4 | 1 7/16 |
| 50 | 21 | 18. | 22¼ | 22¼ | 24¾ | 27¼ | 19 | 30¼ | 9 | 13x 4 | 1 11/16 |
| 60 | 25 | 21½ | 26 | 26½ | 29½ | 32½ | 22½ | 35½ | 10 | 14x 4 | 1 15/16 |
| 70 | 27 | 25 | 30¼ | 30¾ | 34¼ | 37¾ | 26½ | 41¼ | 10 | 16x 4 | 2 3/16 |
| 80 | 30½ | 27 | 34 | 35 | 39 | 43 | 30 | 46½ | 10 | 18x 4 | 2 7/16 |
| 90 | 34½ | 31 | 37¾ | 39¼ | 43¾ | 48¼ | 33½ | 51¾ | 10 | 20x 5 | 2 7/16 |
| 100 | 38 | 34 | 42 | 43½ | 48½ | 53½ | 37 | 57½ | 13 | 22x 6 | 2 11/16 |
| 110 | 42 | 37½ | 45¾ | 47¾ | 53¼ | 58¾ | 41 | 62¾ | 13 | 24x 6 | 2 11/16 |
| 120 | 46 | 41 | 49½ | 52 | 58 | 64 | 44½ | 69 | 13 | 26x 6 | 2 15/16 |
| 130 | 49½ | 44 | 53¼ | 56¼ | 62¾ | 69¼ | 48 | 74¼ | 13 | 28x 6 | 2 15/16 |
| 140 | 53½ | 48 | 57 | 60½ | 67½ | 74½ | 51½ | 79½ | 14 | 30x 7 | 3 3/16 |
| 160 | 60 | 54 | 64½ | 69 | 77 | 85 | 59 | 90 | 14 | 32x 8 | 3 7/16 |
| 180 | 68 | 60 | 73 | 77½ | 86½ | 95½ | 66 | 101½ | 14 | 36x 8 | 3 7/16 |
| 200 | 76 | 66 | 80½ | 86 | 96 | 106 | 73½ | 112 | 15 | 40x10 | 3 15/16 |
| 220 | 84 | 72 | 88 | 94½ | 105½ | 116½ | 80½ | 122½ |  | 44x12 | 4 7/16 |
| 240 | 92 | 78 | 95½ | 103 | 115 | 127 | 87½ | 133 |  | 46x14 | 4 15/16 |

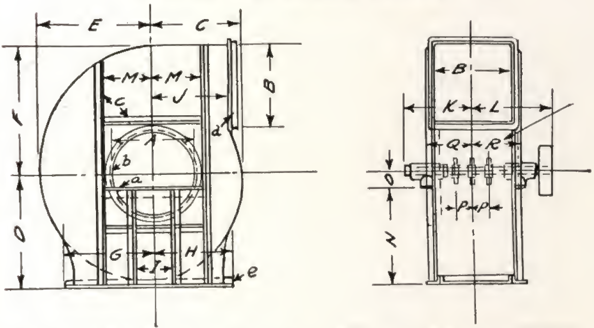
| Size Fan | K | L | M | N | O | P | Q | R | Pulley Size | Shaft Dia. |
|---|---|---|---|---|---|---|---|---|---|---|
| 40 | 14⅝ | 17⅞ | 9¾ | 14⅛ | 4⅜ | Only 1 Spider | 9 5/16 | 9⅛ | 12x 4 | 1 7/16 |
| 50 | 16¾ | 20 | 12 | 17⅝ | 4⅝ |  | 10 13/16 | 10⅝ | 13x 4 | 1 11/16 |
| 60 | 19¾ | 22⅞ | 14 | 20⅜ | 5⅝ |  | 13 1/16 | 12⅞ | 14x 4 | 1 15/16 |
| 70 | 22 | 25⅛ | 15 | 24½ | 5¾ |  | 14 13/16 | 14⅝ | 16x 4 | 2 3/16 |
| 80 | 23½ | 26⅝ | 16¾ | 27 15/16 | 6 1/16 |  | 15 13/16 | 15⅝ | 18x 4 | 2 7/16 |
| 90 | 25½ | 29⅝ | 18¾ | 31 11/16 | 6 1/16 |  | 17 13/16 | 17⅝ | 20x 5 | 2 7/16 |
| 100 | 28⅛ | 33¼ | 20½ | 35 1/16 | 6 15/16 |  | 19 13/16 | 19⅝ | 22x 6 | 2 11/16 |
| 110 | 29⅞ | 35 | 22½ | 38 13/16 | 6 15/16 | 9 | 21 9/16 | 21⅜ | 24x 6 | 2 11/16 |
| 120 | 32¼ | 37⅜ | 24¾ | 42 7/16 | 7 1/16 | 9¾ | 23 5/16 | 23⅛ | 26x 6 | 2 15/16 |
| 130 | 33¾ | 38⅞ | 26½ | 46 3/16 | 7 1/16 | 10½ | 24 13/16 | 24⅝ | 28x 6 | 2 15/16 |
| 140 | 36⅞ | 42⅞ | 28½ | 49¼ | 7¾ | 11½ | 27 5/16 | 27⅛ | 30x 7 | 3 3/16 |
| 160 | 40⅝ | 47⅝ | 31¾ | 56⅝ | 7⅞ | 13 | 30 5/16 | 30⅛ | 32x 8 | 3 7/16 |
| 180 | 43⅝ | 50⅝ | 36¼ | 65⅛ | 7⅞ | 14 | 33 5/16 | 33⅛ | 36x 8 | 3 7/16 |
| 200 | 48⅜ | 57⅜ | 40¼ | 71¼ | 9¼ | 16 | 36 13/16 | 36⅝ | 40x10 | 3 15/16 |
| 220 | 53½ | 64⅛ | 44¼ | 78 | 10 | 17½ | 40 5/16 | 40⅛ | 44x12 | 4 7/16 |
| 240 |  |  | 48¼ |  |  | 19 |  |  | 46x14 | 4 15/16 |

Use Dimension R in above table on pulley side for single inlet fans only. Foundations to be of size and depth as required by the soil.

# The B&B Line of Massachusetts Steel Plate Fans

## Dimensions

### Full housed—Top horizontal discharge



| Size Fan. | A | B | C | D | E | F | G | H | I | Pulley Size | Shaft Dia. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | 16½ | 15 | 16 | 20½ | 20 | 22 | 16 | 14 | 9 | 12x 4 | 1 7/16 |
| 50 | 21 | 18 | 19¾ | 24¾ | 24¾ | 27¼ | 20 | 17 | 9 | 13x 4 | 1 11/16 |
| 60 | 25 | 21½ | 23½ | 29 | 29½ | 32½ | 24 | 21 | 10 | 14x 4 | 1 15/16 |
| 70 | 27 | 25 | 27¼ | 33¾ | 34¼ | 37¾ | 28 | 24 | 10 | 16x 4 | 2 3/16 |
| 80 | 30½ | 27 | 31 | 38 | 39 | 43 | 32 | 27 | 10 | 18x 4 | 2 7/16 |
| 90 | 34½ | 31 | 34¾ | 42¼ | 43¾ | 48¼ | 35 | 30 | 10 | 20x 5 | 2 7/16 |
| 100 | 38 | 34 | 38½ | 47 | 48½ | 53½ | 38 | 33 | 13 | 22x 6 | 2 11/16 |
| 110 | 42 | 37½ | 42¼ | 51¼ | 53¼ | 58¾ | 42 | 36 | 13 | 24x 6 | 2 11/16 |
| 120 | 46 | 41 | 46 | 55½ | 58 | 64 | 46 | 40 | 13 | 26x 6 | 2 15/16 |
| 130 | 49½ | 44 | 49¾ | 59¾ | 62¾ | 69¼ | 50 | 43 | 13 | 28x 6 | 2 15/16 |
| 140 | 53½ | 48 | 53½ | 64 | 67½ | 74½ | 53 | 45 | 14 | 30x 7 | 3 3/16 |
| 160 | 60 | 54 | 61 | 72½ | 77 | 85 | 60 | 50 | 14 | 32x 8 | 3 7/16 |
| 180 | 68 | 60 | 68½ | 82 | 86½ | 95½ | 67 | 56 | 14 | 36x 8 | 3 7/16 |
| 200 | 76 | 66 | 76 | 92½ | 96 | 106 | 74 | 64 | 15 | 40x10 | 3 15/16 |
| 220 | 84 | 72 | 83½ | 99 | 105½ | 116½ | 82 | 72 | | 44x12 | 4 7/16 |
| 240 | 92 | 78 | 91 | 107½ | 115 | 127 | 90 | 82 | | 46x14 | 4 15/16 |

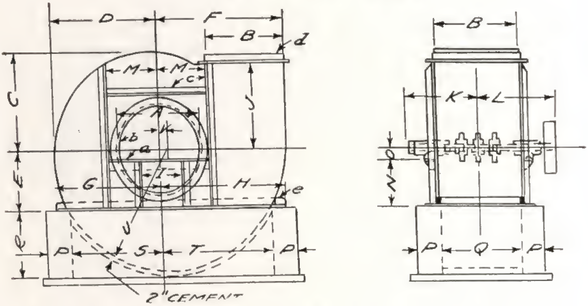
| Size Fan | J | K | L | M | N | O | P | Q | R | Pulley Size | Shaft Dia. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | 15 | 14⅝ | 17⅞ | 9¾ | 16⅛ | 4⅜ | Only 1 Spider | 9 5/16 | 9⅛ | 12x 4 | 1 7/16 |
| 50 | 18 | 16¾ | 20 | 12 | 20⅛ | 4⅝ | | 10 13/16 | 10⅝ | 13x 4 | 1 11/16 |
| 60 | 21 | 19¾ | 22⅞ | 14 | 23⅜ | 5⅝ | | 13 1/16 | 12⅞ | 14x 4 | 1 15/16 |
| 70 | 24½ | 22 | 25⅛ | 15 | 28 | 5¾ | | 14 13/16 | 14⅝ | 16x 4 | 2 3/16 |
| 80 | 26½ | 23½ | 26⅝ | 16¾ | 31 15/16 | 6 1/16 | | 15 13/16 | 15⅝ | 18x 4 | 2 7/16 |
| 90 | 30¼ | 25½ | 29⅝ | 18¾ | 36 3/16 | 6 1/16 | | 17 13/16 | 17⅝ | 20x 5 | 2 7/16 |
| 100 | 32¾ | 28⅛ | 33¼ | 20½ | 40 1/16 | 6 15/16 | | 19 13/16 | 19⅝ | 22x 6 | 2 11/16 |
| 110 | 35¾ | 29⅞ | 35 | 22½ | 44 5/16 | 6 15/16 | 9 | 21 9/16 | 21⅜ | 24x 6 | 2 11/16 |
| 120 | 39½ | 32¼ | 37⅜ | 24¾ | 48 7/16 | 7 1/16 | 9¾ | 23 5/16 | 23⅛ | 26x 6 | 2 15/16 |
| 130 | 42¼ | 33¾ | 38⅞ | 26½ | 52 11/16 | 7 1/16 | 10½ | 24 13/16 | 24⅝ | 28x 6 | 2 15/16 |
| 140 | 45½ | 36⅞ | 42⅞ | 28½ | 56¼ | 7¾ | 11½ | 27 5/16 | 27⅛ | 30x 7 | 3 3/16 |
| 160 | 51½ | 40⅝ | 47⅝ | 31¾ | 64⅝ | 7⅞ | 13 | 30 5/16 | 30⅛ | 32x 8 | 3 7/16 |
| 180 | 57½ | 43⅝ | 50⅝ | 36¼ | 74⅛ | 7⅞ | 14 | 33 5/16 | 33⅛ | 36x 8 | 3 7/16 |
| 200 | 63½ | 48⅜ | 57⅜ | 40¼ | 81¼ | 9¼ | 16 | 36 13/16 | 36⅝ | 40x10 | 3 15/16 |
| 220 | 69½ | 53½ | 64⅛ | 44¼ | 89 | 10 | 17½ | 40 5/16 | 40⅛ | 44x12 | 4 7/16 |
| 240 | 76¼ | | | 48¼ | | | 19 | | | 46x14 | 4 15/16 |

Use Dimension R in above table on pulley side for single inlet fans only Foundations to be of size and depth as required by the soil.

# The B&B Line of Massachusetts Steel Plate Fans

## Dimensions

¾ housing—Top vertical discharge



| Size Fan | A | B | C | D | E | F | G | H | I | J | K | Pulley Size | Shaft Dia. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60 | 25 | 21½ | 23½ | 26½ | 16 | 32½ | 26½ | 31⅜ | 10 | 21 | 19¾ | 14x 4 | 1 15/16 |
| 70 | 27 | 25 | 27¼ | 30¾ | 17½ | 37¾ | 30⅜ | 37⅛ | 10 | 24½ | 22 | 16x 4 | 2 3/16 |
| 80 | 30½ | 27 | 31 | 35 | 19¼ | 43 | 35½ | 42 | 10 | 26½ | 23½ | 18x 4 | 2 7/16 |
| 90 | 34½ | 31 | 34¾ | 39¼ | 21¼ | 48¼ | 39⅜ | 46⅝ | 10 | 30½ | 25½ | 20x 5 | 2 7/16 |
| 100 | 38 | 34 | 38½ | 43½ | 23½ | 53½ | 43⅞ | 52 | 13 | 33⅜ | 28⅛ | 22x 6 | 2 11/16 |
| 110 | 42 | 37½ | 42¼ | 47¾ | 25½ | 58¾ | 47¾ | 56¾ | 13 | 36⅞ | 29⅞ | 24x 6 | 2 11/16 |
| 120 | 46 | 41 | 46 | 52 | 27¾ | 64 | 52½ | 62⅜ | 13 | 40¼ | 32¼ | 26x 6 | 2 15/16 |
| 130 | 49½ | 44 | 49¾ | 56¼ | 29½ | 69¼ | 56½ | 67¼ | 13 | 43¼ | 33¾ | 28x 6 | 2 15/16 |
| 140 | 53½ | 48 | 53½ | 60½ | 31½ | 74½ | 60⅜ | 71⅞ | 14 | 47¼ | 36⅞ | 30x 7 | 3 3/16 |
| 160 | 60 | 54 | 61 | 69 | 34¾ | 85 | 68½ | 81¾ | 14 | 53¼ | 40⅝ | 32x 8 | 3 9/16 |
| 180 | 68 | 60 | 68½ | 77½ | 40¼ | 95½ | 77⅛ | 91⅞ | 14 | 59¼ | 43⅝ | 36x 8 | 3 7/16 |
| 200 | 76 | 66 | 76 | 86 | 44¼ | 106 | 84⅞ | 101¼ | 15 | 65¼ | 48⅜ | 40x10 | 3 15/16 |
| 220 | 84 | 72 | 83½ | 94½ | 48¼ | 116½ | 92¾ | 110¾ |  | 71¼ | 53½ | 44x12 | 4 7/16 |
| 240 | 92 | 78 | 91 | 103 | 52¼ | 127 | 100½ | 120⅛ |  | 77¼ |  | 46x14 | 4 15/16 |

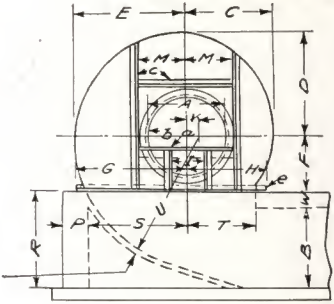
| Size Fan | L | M | N | O | P | Q | R | S | T | U | V | Pulley Size | Shaft Dia. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60 | 22⅞ | 14 | 10⅜ | 5⅝ | 8 | 21 | 15½ | 22½ | 27¼ | 29½ | 2⅜ | 14x 4 | 1 15/16 |
| 70 | 25⅛ | 15 | 11¾ | 5¾ | 8 | 24½ | 18¾ | 26¾ | 32¼ | 34¼ | 2¾ | 16x 4 | 2 3/16 |
| 80 | 26⅝ | 16¾ | 13 3/16 | 6 1/16 | 8 | 26½ | 21¾ | 30¾ | 37 | 39 | 3⅛ | 18x 4 | 2 7/16 |
| 90 | 29⅝ | 18¾ | 15 3/16 | 6 1/16 | 8 | 30½ | 24½ | 34¾ | 41¾ | 43¾ | 3½ | 20x 5 | 2 7/16 |
| 100 | 33¼ | 20½ | 16 9/16 | 6 15/16 | 8 | 33⅜ | 27 | 38⅜ | 46⅜ | 48½ | 4 | 22x 6 | 2 11/16 |
| 110 | 35 | 22½ | 18 9/16 | 6 15/16 | 8 | 36⅞ | 29¾ | 42⅜ | 51⅛ | 53¼ | 4⅜ | 24x 6 | 2 11/16 |
| 120 | 37⅜ | 24¾ | 20 11/16 | 7 1/16 | 12 | 40¼ | 32¼ | 46¼ | 55¾ | 58 | 4¾ | 26x 6 | 2 15/16 |
| 130 | 38⅞ | 26 | 22 7/16 | 7 1/16 | 12 | 43¼ | 35¼ | 50⅛ | 60½ | 62¾ | 5 3/16 | 28x 6 | 2 15/16 |
| 140 | 42⅞ | 28½ | 23¾ | 7¾ | 12 | 47¼ | 38 | 54 | 65¼ | 67½ | 5½ | 30x 7 | 3 3/16 |
| 160 | 47⅝ | 31¾ | 26⅞ | 7⅞ | 12 | 53¼ | 44¼ | 62¼ | 75¼ | 77 | 6½ | 32x 8 | 3 7/16 |
| 180 | 50⅝ | 36¼ | 32⅜ | 7⅞ | 12 | 59¼ | 48¼ | 69¼ | 83¾ | 86½ | 7¼ | 36x 8 | 3 7/16 |
| 200 | 57⅜ | 40¼ | 35 | 9¼ | 12 | 65¼ | 53¾ | 77¼ | 93¼ | 96 | 8 | 40x10 | 3 15/16 |
| 220 | 64⅛ | 44¼ | 38¼ | 10 | 16 | 71¼ | 59¼ | 84⅞ | 102¾ | 105½ | 8 15/16 | 44x12 | 4 7/16 |
| 240 |  | 48¼ |  |  | 16 | 77¼ | 64¾ | 92¾ | 112¼ | 115 | 9¾ | 46x14 | 4 15/16 |

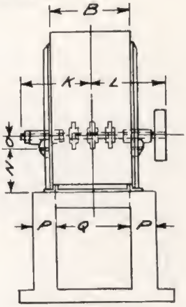
Foundtions to be of a size and depth as required by the soil.

# The B&B Line of Massachusetts Steel Plate Fans

## Dimensions

### ¾ housed—Bottom horizontal discharge





| Size Fan | A | B | C | D | E | F | G | H | I | K | L | Pulley Size | Shaft Dia. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60 | 25 | 21½ | 23½ | 26½ | 29½ | 16 | 29⅞ | 20⅛ | 10 | 19¾ | 22⅞ | 14x 4 | $1\frac{15}{16}$ |
| 70 | 27 | 25 | 27¼ | 30¾ | 34¼ | 17½ | 34⅞ | 24 | 10 | 22 | 25⅛ | 16x 4 | $2\frac{3}{16}$ |
| 80 | 30½ | 27 | 31 | 35 | 39 | 19¼ | 39¾ | 27⅝ | 10 | 23½ | 26⅝ | 18x 4 | $2\frac{7}{16}$ |
| 90 | 34½ | 31 | 34¾ | 39¼ | 43¾ | 21¼ | 44¼ | 30½ | 10 | 25½ | 29⅝ | 20x 5 | $2\frac{7}{16}$ |
| 100 | 38 | 34 | 38½ | 43½ | 48½ | 23½ | 49¼ | 34¼ | 13 | 28⅛ | 33¼ | 22x 6 | $2\frac{11}{16}$ |
| 110 | 42 | 37½ | 42¼ | 47¾ | 53¼ | 25½ | 53⅝ | 37⅛ | 13 | 29⅞ | 35 | 24x 6 | $2\frac{11}{16}$ |
| 120 | 46 | 41 | 46 | 52 | 58 | 27¾ | 59 | 40⅞ | 13 | 32¼ | 37⅜ | 26x 6 | $2\frac{15}{16}$ |
| 130 | 49½ | 44 | 49¾ | 56¼ | 62¾ | 29½ | 63½ | 44 | 13 | 33¾ | 38⅞ | 28x 6 | $2\frac{15}{16}$ |
| 140 | 53½ | 48 | 53½ | 60½ | 67½ | 31½ | 68 | 47¼ | 14 | 36⅞ | 42⅞ | 30x 7 | $3\frac{3}{16}$ |
| 160 | 60 | 54 | 61 | 69 | 77 | 34¾ | 77¼ | 53⅜ | 14 | 40⅝ | 47⅝ | 32x 8 | $3\frac{7}{16}$ |
| 180 | 68 | 60 | 68½ | 77½ | 86½ | 40¼ | 86¾ | 59⅞ | 14 | 43⅝ | 50⅝ | 36x 8 | $3\frac{7}{16}$ |
| 200 | 76 | 66 | 76 | 86 | 96 | 44¼ | 95⅝ | 65¾ | 15 | 48⅜ | 57⅜ | 40x10 | $3\frac{15}{16}$ |
| 220 | 84 | 72 | 83½ | 94½ | 105½ | 48¼ | 104½ | 71⅝ | | 53½ | 64⅛ | 44x12 | $4\frac{7}{16}$ |
| 240 | 92 | 78 | 91 | 103 | 115 | 52¼ | 113½ | 77¼ | | | | 46x14 | $4\frac{15}{16}$ |

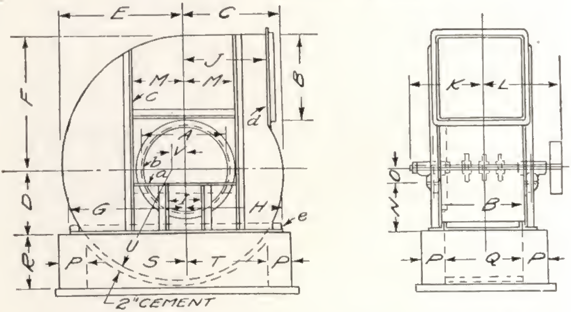
| Size Fan | M | N | O | P | Q | R | S | T | U | V | W | Pulley Size | Shaft Dia. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60 | 14 | 10⅜ | 5⅝ | 8 | 21 | 27½ | 25¼ | 17⅛ | 32½ | 3 | 6 | 14x 4 | $1\frac{15}{16}$ |
| 70 | 15 | 11¾ | 5¾ | 8 | 24½ | 31 | 30 | 20½ | 37¾ | 3½ | 6 | 16x 4 | $2\frac{3}{16}$ |
| 80 | 16¾ | $13\frac{3}{16}$ | $6\frac{1}{16}$ | 8 | 26½ | 33 | 35¼ | 24⅛ | 43 | 4 | 6 | 18x 4 | $2\frac{7}{16}$ |
| 90 | 18¾ | $15\frac{3}{16}$ | $6\frac{1}{16}$ | 8 | 30½ | 37 | 38 | 27 | 48¼ | 4½ | 6 | 20x 5 | $2\frac{7}{16}$ |
| 100 | 20½ | $16\frac{9}{16}$ | $6\frac{15}{16}$ | 8 | 33⅜ | 40 | 44 | 30¼ | 53½ | 5 | 6 | 22x 6 | $2\frac{11}{16}$ |
| 110 | 22½ | $18\frac{9}{16}$ | $6\frac{15}{16}$ | 8 | 36⅞ | 45½ | 48½ | 33⅛ | 58¾ | 5½ | 8 | 24x 6 | $2\frac{11}{16}$ |
| 120 | 24¾ | $20\frac{11}{16}$ | $7\frac{1}{16}$ | 12 | 40¼ | 49 | 52 | 35⅞ | 64 | 6 | 8 | 26x 6 | $2\frac{15}{16}$ |
| 130 | 26½ | $22\frac{7}{16}$ | $7\frac{1}{16}$ | 12 | 43¼ | 52 | 56 | 39 | 69¼ | 6½ | 8 | 28x 6 | $2\frac{15}{16}$ |
| 140 | 28½ | 23¾ | 7¾ | 12 | 47¼ | 56 | 61 | 42¼ | 74¼ | 7 | 8 | 30x 7 | $3\frac{3}{16}$ |
| 160 | 31¾ | 26⅞ | 7⅞ | 12 | 53¼ | 62 | 70 | 48⅜ | 85 | 8 | 8 | 32x 8 | $3\frac{7}{16}$ |
| 180 | 36¼ | 32⅜ | 7⅞ | 12 | 59¼ | 68 | 79 | 53⅞ | 95½ | 9 | 8 | 36x 8 | $3\frac{7}{16}$ |
| 200 | 40¼ | 35 | 9¼ | 12 | 65¼ | 76 | 87 | 59¾ | 106 | 10 | 10 | 40x10 | $3\frac{15}{16}$ |
| 220 | 44¼ | 38¼ | 10 | 16 | 71¼ | 82 | 96 | 65⅝ | 116½ | 11 | 10 | 44x12 | $4\frac{7}{16}$ |
| 240 | 48¼ | | | 16 | 77¼ | 88 | 105 | 71¼ | 127 | 12 | 10 | 46x14 | $4\frac{15}{16}$ |

Use a 2-inch thickness of cement on the dotted lines shown in the cut. Foundations to be of size and depth as required by the soil.

# The B&B Line of Massachusetts Steel Plate Fans

## Dimensions

### ¾ housed—Top horizontal discharge



| Size Fan | A | B | C | D | E | F | G | H | I | J | K | Pulley Size | Shaft Dia. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | | |
| 60 | 25 | 21½ | 23½ | 16 | 29½ | 32½ | 27⅞ | 23⅛ | 10 | 21 | 19¾ | 14x 4 | 1 15/16 |
| 70 | 27 | 25 | 27¼ | 17½ | 34¼ | 37¾ | 33⅛ | 27½ | 10 | 24½ | 22 | 16x 4 | 2 3/16 |
| 80 | 30½ | 27 | 31 | 19¼ | 39 | 43 | 37⅜ | 31 | 10 | 26½ | 23½ | 18x 4 | 2 7/16 |
| 90 | 34½ | 31 | 34¾ | 21¼ | 43¾ | 48¼ | 41½ | 34⅜ | 10 | 30¼ | 25½ | 20x 5 | 2 7/16 |
| 100 | 38 | 34 | 38½ | 23½ | 48½ | 53½ | 46⅜ | 38⅜ | 13 | 32¾ | 28⅛ | 22x 6 | 2 11/16 |
| 110 | 42 | 37½ | 42¼ | 25½ | 53¼ | 58¾ | 50½ | 41¾ | 13 | 35⅜ | 29⅞ | 24x 6 | 2 11/16 |
| 120 | 46 | 41 | 46 | 27¾ | 58 | 64 | 55½ | 46 | 13 | 39½ | 32¼ | 26x 6 | 2 15/16 |
| 130 | 49½ | 44 | 49¾ | 29½ | 62¾ | 69¼ | 59¾ | 49⅜ | 13 | 42¼ | 33¾ | 28x 6 | 2 15/16 |
| 140 | 53½ | 48 | 53½ | 31½ | 67½ | 74½ | 64 | 52¾ | 14 | 45½ | 36⅞ | 30x 7 | 3 3/16 |
| 160 | 60 | 54 | 61 | 34¾ | 77 | 85 | 72⅝ | 59¾ | 14 | 51½ | 40⅝ | 32x 8 | 3 7/16 |
| 180 | 68 | 60 | 68½ | 40¼ | 86½ | 95½ | 81⅝ | 67¼ | 14 | 57½ | 43⅝ | 36x 8 | 3 7/16 |
| 200 | 76 | 66 | 76 | 44¼ | 96 | 106 | 90 | 74 | 15 | 63½ | 48⅜ | 40x10 | 3 15/16 |
| 220 | 84 | 72 | 83½ | 48¼ | 105½ | 116½ | 98¼ | 80⅝ | | 69½ | 53½ | 44x12 | 4 7/16 |
| 240 | 92 | 78 | 91 | 52¼ | 115 | 127 | 106⅝ | 87⅜ | | 76¼ | | 46x14 | 4 15/16 |

| Size Fan | L | M | N | O | P | Q | R | S | T | U | V | Pulley Size | Shaft Dia. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | | |
| 60 | 22⅞ | 14 | 10⅜ | 5⅝ | 8 | 21 | 12½ | 23⅜ | 18⅞ | 26½ | 2¼ | 14x 4 | 1 15/16 |
| 70 | 25⅛ | 15 | 11¾ | 5¾ | 8 | 24½ | 15¼ | 27⅞ | 22⅝ | 30¾ | 2⅝ | 16x 4 | 2 3/16 |
| 80 | 26⅝ | 16¾ | 13 3/16 | 6 1/16 | 8 | 26½ | 17¾ | 32¼ | 26⅛ | 35 | 3 1/16 | 18x 4 | 2 7/16 |
| 90 | 29⅝ | 18¾ | 15 3/16 | 6 1/16 | 8 | 30½ | 20 | 36½ | 29½ | 39¼ | 3½ | 20x 5 | 2 7/16 |
| 100 | 33¼ | 20½ | 16 9/16 | 6 15/16 | 8 | 33⅜ | 22 | 40½ | 32¾ | 43½ | 3⅞ | 22x 6 | 2 11/16 |
| 110 | 35 | 22½ | 18 9/16 | 6 15/16 | 8 | 36⅞ | 24¼ | 44⅝ | 36 | 47¾ | 4 5/16 | 24x 6 | 2 11/16 |
| 120 | 37⅜ | 24¾ | 20 11/16 | 7 1/16 | 12 | 40¼ | 26¼ | 48½ | 39¼ | 52 | 4⅝ | 26x 6 | 2 15/16 |
| 130 | 38⅞ | 26½ | 22 7/16 | 7 1/16 | 12 | 43¼ | 28¾ | 53 | 42¾ | 56¼ | 5⅛ | 28x 6 | 2 15/16 |
| 140 | 42⅞ | 28½ | 23¾ | 7¾ | 12 | 47¼ | 31 | 57 | 46¼ | 60½ | 5⅜ | 30x 7 | 3 3/16 |
| 160 | 47⅝ | 31¾ | 26⅞ | 7⅞ | 12 | 53¼ | 36¼ | 65⅞ | 53⅛ | 69 | 6⅜ | 32x 8 | 3 7/16 |
| 180 | 50⅝ | 36¼ | 32⅜ | 7⅞ | 12 | 59¼ | 39¼ | 73¼ | 59⅛ | 77½ | 7 1/16 | 36x 8 | 3 7/16 |
| 200 | 57⅜ | 40¼ | 35 | 9¼ | 12 | 65¼ | 43¾ | 81½ | 66 | 86 | 7¾ | 40x10 | 3 15/16 |
| 220 | 64⅛ | 44¼ | 38¼ | 10 | 16 | 71¼ | 48¼ | 90 | 72½ | 94½ | 8¾ | 44x12 | 4 7/16 |
| 240 | | 48¼ | | | 16 | 77¼ | 52¾ | 98 | 79¼ | 103 | 9⅜ | 46x14 | 4 15/16 |

Foundations to be of a size and depth as required by the soil

# The B&B Line of Massachusetts Steel Plate Fans

CAPACITY TABLE FOR STEEL PLATE FANS

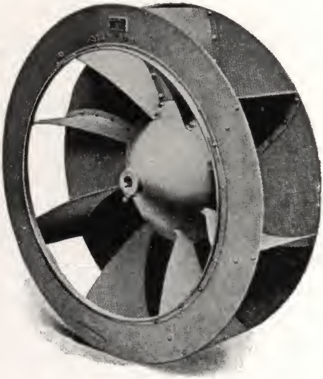
| Size | Dia. Wheel | Inlet Diam. | Outlet Size | Pulley | | | PRESSURE IN OUNCES PER SQUARE INCH | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Face | Dia. | | ¼ | ½ | ¾ | 1 | 1¼ | 1½ | 2 | 2½ | 3 |
| 40 | 24 | 16½ | 15 x15 | 12 | 4 | C.F M. | 1,825 | 2,585 | 3,160 | 3,650 | 4,080 | 4,480 | 5,170 | 5,760 | 6,330 |
| | | | | | | R.P.M. | 482 | 682 | 835 | 965 | 1.078 | 1,181 | 1,365 | 1,522 | 1,670 |
| | | | | | | B.H.P | .311 | .884 | 1.62 | 2.50 | 3.48 | 4.60 | 7.08 | 9.82 | 13.00 |
| 50 | 30 | 21 | 18 x18 | 13 | 4 | C.F.M. | 2,790 | 3,950 | 4,840 | 5,580 | 6,240 | 6,850 | 7,900 | 8,850 | 9,700 |
| | | | | | | R.P.M. | 386 | 545 | 667 | 770 | 862 | 945 | 1,090 | 1,220 | 1,335 |
| | | | | | | B.H.P. | .48 | 1.35 | 2.48 | 3.81 | 5.32 | 7.05 | 10.80 | 15.50 | 19.80 |
| 60 | 36 | 25 | 21½x21½ | 14 | 4 | C.F.M | 4,080 | 5,770 | 7,200 | 8,170 | 9,150 | 10,000 | 11,520 | 12,990 | 14,100 |
| | | | | | | R.P.M. | 321 | 454 | 556 | 642 | 718 | 786 | 907 | 1,015 | 1,110 |
| | | | | | | B.H.P. | 70 | 1.97 | 3.68 | 5.57 | 7.81 | 10.22 | 15.70 | 22.00 | 28.62 |
| 70 | 42 | 27 | 25 x25 | 16 | 4 | C.F.M. | 5,180 | 7,320 | 8,990 | 10,350 | 11,600 | 12,700 | 14,620 | 16,400 | 17,950 |
| | | | | | | R.P.M. | 276 | 389 | 477 | 550 | 615 | 674 | 777 | 870 | 953 |
| | | | | | | B.H.P. | 88 | 2.53 | 4 60 | 7.05 | 9.89 | 13.00 | 19.95 | 27.95 | 36.75 |
| 80 | 48 | 30½ | 27 x27 | 18 | 4 | C.F.M. | 6,250 | 8,850 | 10,860 | 12,500 | 14,000 | 15,350 | 17,700 | 19,800 | 21,700 |
| | | | | | | R.P.M. | 241 | 341 | 418 | 482 | 538 | 591 | 682 | 762 | 836 |
| | | | | | | B.H.P. | 1.07 | 3.03 | 5.55 | 8.53 | 11.95 | 15.70 | 24.15 | 33.75 | 44.40 |
| 90 | 54 | 34½ | 31 x31 | 20 | 5 | C.F.M | 8,300 | 11,700 | 14.320 | 16,550 | 18,550 | 20,250 | 23,400 | 26,175 | 28,650 |
| | | | | | | R.P.M. | 215 | 303 | 372 | 428 | 480 | 525 | 606 | 678 | 742 |
| | | | | | | B.H.P. | 1.42 | 4.00 | 7.33 | 11.30 | 15.85 | 20.70 | 31.90 | 44.60 | 58.60 |
| 100 | 60 | 38 | 34 x34 | 22 | 6 | C.F.M. | 10.100 | 14,280 | 17,500 | 20,200 | 22,600 | 24,680 | 28,600 | 31,900 | 35,000 |
| | | | | | | R.P.M. | 193 | 273 | 334 | 386 | 432 | 472 | 546 | 610 | 668 |
| | | | | | | B.H.P. | 1.72 | 4.87 | 8.95 | 13.75 | 19.30 | 25.12 | 39.00 | 54.40 | 71.60 |
| 110 | 66 | 42 | 37½x37½ | 24 | 6 | C.F.M. | 12.365 | 17,530 | 21,400 | 24.720 | 27,700 | 30,390 | 35,190 | 39,200 | 42,900 |
| | | | | | | R.P.M | 175 | 248 | 303 | 350 | 392 | 430 | 497 | 554 | 607 |
| | | | | | | B.H P. | 2.11 | 6.00 | 10.78 | 16.85 | 23.61 | 31.05 | 48.00 | 66.80 | 87.80 |
| 120 | 72 | 46 | 41 x41 | 26 | 6 | C.F.M. | 14,950 | 21,070 | 25.800 | 29,800 | 33,210 | 36,500 | 42,250 | 47,150 | 51,600 |
| | | | | | | R.P.M. | 161 | 227 | 278 | 321 | 358 | 393 | 455 | 508 | 556 |
| | | | | | | B.H.P. | 2.55 | 7.20 | 13 20 | 20.30 | 28.35 | 37.35 | 57.65 | 80.40 | 105.60 |
| 130 | 78 | 49½ | 44 x44 | 28 | 6 | C.F.M. | 17,300 | 24,550 | 30,080 | 34,750 | 38,810 | 42,600 | 49.150 | 54,900 | 60,200 |
| | | | | | | R.P.M. | 148 | 210 | 257 | 297 | 332 | 364 | 420 | 470 | 514 |
| | | | | | | B.H.P. | 2.95 | 8.40 | 15.35 | 23.70 | 33.10 | 43.50 | 67.00 | 93.70 | 123.20 |
| 140 | 84 | 53½ | 48 x48 | 30 | 7 | C.F M. | 20,525 | 29,000 | 35,525 | 41,100 | 45,800 | 50,250 | 57,950 | 64,750 | 71,150 |
| | | | | | | R.P.M | 138 | 195 | 239 | 276 | 308 | 338 | 390 | 436 | 478 |
| | | | | | | B.H.P | 3.05 | 9.91 | 18.20 | 28.05 | 39.10 | 51.35 | 79.00 | 110.50 | 145.80 |
| 160 | 96 | 60 | 54 x54 | 32 | 8 | C.F.M | 25,800 | 36,425 | 44,800 | 51,600 | 57,750 | 63,150 | 73,150 | 81,600 | 89,200 |
| | | | | | | R.P.M. | 121 | 171 | 210 | 242 | 271 | 296 | 343 | 383 | 418 |
| | | | | | | B.H P. | 4 40 | 12.46 | 22.90 | 35.20 | 49.25 | 64.50 | 99.80 | 139.00 | 182.60 |
| 180 | 108 | 68 | 60 x60 | 36 | 8 | C.F.M. | 32,400 | 46,000 | 56,350 | 65,150 | 72,700 | 79,900 | 92,100 | 103,000 | 112,500 |
| | | | | | | R.P M. | 107 | 152 | 186 | 215 | 240 | 264 | 304 | 340 | 372 |
| | | | | | | B.H.P. | 5.52 | 15.73 | 28.80 | 44.50 | 62.00 | 82.5 | 125.60 | 175.60 | 230.00 |
| 200 | 120 | 76 | 66 x66 | 40 | 10 | C.F.M. | 39,900 | 56,600 | 69,150 | 79,800 | 89,500 | 97,800 | 113,100 | 126,500 | 138,600 |
| | | | | | | R.P.M. | 96 | 136 | 166 | 192 | 215 | 235 | 272 | 304 | 333 |
| | | | | | | B.H.P. | 6.80 | 19.35 | 35.40 | 54.40 | 76.35 | 100.00 | 154.20 | 219.50 | 283.50 |
| 220 | 132 | 84 | 72 x72 | 44 | 12 | C.F.M. | 48,350 | 68,150 | 83,500 | 96,200 | 107,800 | 118,150 | 136,200 | 152,250 | 166,500 |
| | | | | | | R.P.M | 88 | 124 | 152 | 175 | 196 | 215 | 248 | 277 | 303 |
| | | | | | | B.H.P. | 8.23 | 23.15 | 42.75 | 65.60 | 91.80 | 121.00 | 185.80 | 259.50 | 340.50 |
| 240 | 144 | 92 | 78 x78 | 46 | 14 | C.F.M | 57,300 | 80,700 | 99,150 | 113,950 | 127,250 | 139,500 | 161,400 | 180,500 | 197,500 |
| | | | | | | R.P.M. | 81 | 114 | 140 | 161 | 180 | 197 | 228 | 255 | 279 |
| | | | | | | B.H.P | 9.75 | 27.60 | 50.70 | 77.60 | 108.60 | 142.60 | 220.50 | 307.50 | 404.00 |

Horse-power in the above table is net, no allowance having been made for belt slip, etc.

# The B&B Line of Massachusetts Cone Fans

The Massachusetts cone type fan is a peripheral discharge fan and can be installed in limited spaces, requiring about the same space as the Massachusetts Davidson Fan. It delivers air against higher pressures than will the Davidson type.

The cone fan consists of a series of backward curved blades arranged about a center cone casting having its apex towards the inlet side of the wheel. Cone fans are usually installed without a casing, the air being discharged from the circumference of the wheel equally in all directions and in a plane at right angles to the axis. The floats curved backwards at a considerable angle, and the cone-shaped inlet produce a very smooth running fan.



The cone fan is largely used to save space. When it is encased in a housing it will work against medium air pressures and will handle large volumes of air. The curved blades eliminate eddy currents and shock of air and this type of fan is accordingly relatively high in efficiency.

The cone fan is largely used in theatres, hospitals and similar institutional work, where it is arranged to discharge directly into a large plenum chamber, from which emerge the various warm air ducts.

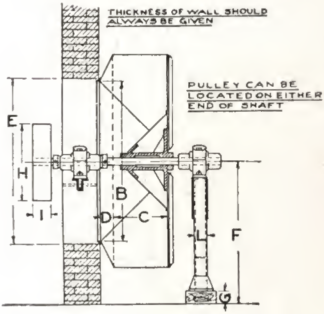
The frame and side plate of the Massachusetts Cone Fan are of steel, the blades are flanged and secured to the side plate and cone by bolts and rivets. The cone wheel may be arranged for belt drive, or may be direct connected to an engine or motor. The drive may be located on either end of the shaft.

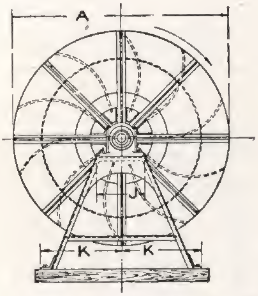
The air is drawn by the fan from the heating chamber on one side of a division wall when this fan is used on heating and ventilating work. In this division wall there is located an inlet opening concentric with the eye of the wheel. The heated air is delivered by the fan into the plenum chamber on the other side of the division wall, and thence into the system of ducts.

# The B&B Line of Massachusetts Cone Fans

## Dimensions

Wall setting for standard Massachusetts cone fans.


THICKNESS OF WALL SHOULD ALWAYS BE GIVEN
PULLEY CAN BE LOCATED ON EITHER END OF SHAFT
E
H
I
B
D
C
L
F
G



| Size Fan | Shaft Dia. | A | B | C | D | E | F | G | H | I | J | K |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 | 1$\frac{3}{16}$ | 24 | 18 | 6 | 1⅛ | 20 | 24 | 2 | 10 | 4 | 8 | 12 |
| 30 | 1$\frac{7}{16}$ | 30 | 22½ | 7½ | 1⅜ | 24½ | 27 | 2 | 12 | 4 | 9 | 13 |
| 36 | 1$\frac{7}{16}$ | 36 | 27 | 9 | 1⅝ | 29 | 30 | 3 | 14 | 4 | 9 | 13½ |
| 42 | 1$\frac{11}{16}$ | 42 | 31½ | 10½ | 1⅞ | 33½ | 33 | 3 | 16 | 4 | 9 | 14¼ |
| 48 | 1$\frac{15}{16}$ | 48 | 36 | 12 | 2$\frac{3}{16}$ | 38 | 36 | 3 | 18 | 4 | 10 | 15¼ |
| 54 | 2$\frac{3}{16}$ | 54 | 40½ | 13½ | 2½ | 42½ | 39 | 3 | 20 | 4 | 10 | 16½ |
| 60 | 2$\frac{7}{16}$ | 60 | 45 | 15 | 2¾ | 47 | 42 | 4 | 22 | 6 | 10 | 17½ |
| 66 | 2$\frac{7}{16}$ | 66 | 49½ | 16½ | 3 | 51½ | 45 | 4 | 24 | 6 | 10 | 18½ |
| 72 | 2$\frac{11}{16}$ | 72 | 54 | 18 | 3¼ | 56 | 48 | 4 | 26 | 6 | 13 | 20½ |
| 84 | 2$\frac{15}{16}$ | 84 | 63 | 21 | 3⅞ | 65½ | 60 | 4 | 30 | 8 | 13 | 23½ |
| 96 | 3$\frac{3}{16}$ | 96 | 72 | 24 | 4⅜ | 74½ | 66 | 4 | 34 | 8 | 14 | 25½ |
| 108 | 3$\frac{7}{16}$ | 108 | 81 | 27 | 4⅞ | 83½ | 72 | 4 | 38 | 10 | 14 | 27 |
| 120 | 3$\frac{7}{16}$ | 120 | 90 | 30 | 5½ | 93 | 78 | 4 | 42 | 10 | 14 | 28¾ |
| 132 | 3$\frac{15}{16}$ | 132 | 99 | 33 | 6 | 102 | 84 | 6 | 48 | 12 | 16 | 30½ |
| 144 | 3$\frac{15}{16}$ | 144 | 108 | 36 | 6½ | 111 | 90 | 6 | 54 | 12 | 16 | 32 |

# The B&B Line of Massachusetts Cone Fans

## Capacities of Massachusetts Cone Fans

## Free Inlet, Restricted Outlet

**Dynamic Pressure in Inches of Water Gauge**
For static pressure deduct 18.4%
For velocity pressure deduct 81.6%

Fan discharging directly into plenum chamber from which ducts convey air to various rooms.

| Diameter of Wheel | Dia. Inlet | Pulley | | FREE INLET, RESTRICTED OUTLET | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Face | Dia. | Press | .324 in. | .433 in. | .649 in. | .865 in. | 1.08 in. | 1.30 in | 1.73 in. |
| | | | | P. V. | 3095 | 3575 | 4375 | 5060 | 5645 | 6190 | ·7145 |
| 24 | 20 | 4 | 10 | C.F.M. | 1,718 | 1,990 | 2,440 | 2,815 | 3,130 | 3,442 | 3,975 |
| | | | | R.P.M. | 492 | 570 | 695 | 806 | 897 | 987 | 1,140 |
| | | | | B.H.P. | .26 | .40 | .73 | 1.13 | 1.56 | 2.08 | 3.24 |
| 30 | 24½ | 4 | 12 | C.F.M. | 2,680 | 3,110 | 3,800 | 4,370 | 4,880 | 5,370 | 6,210 |
| | | | | R.P.M. | 394 | 457 | 558 | 644 | 718 | 789 | 912 |
| | | | | B.H.P. | .40 | .64 | 1.14 | 1.78 | 2.44 | 3.24 | 5.03 |
| 36 | 29 | 4 | 14 | C.F.M. | 3,865 | 4,460 | 5,440 | 6,295 | 7,010 | 7,710 | 8,890 |
| | | | | R.P.M. | 328 | 380 | 465 | 537 | 598 | 657 | 758 |
| | | | | B.H.P. | .59 | .91 | 1.64 | 2.56 | 3.54 | 4.80 | 7.15 |
| 42 | 33½ | 4 | 16 | C.F.M. | 5,280 | 6,125 | 7,440 | 8,650 | 9,640 | 10,600 | 12,280 |
| | | | | R.P.M. | 281 | 326 | 398 | 460 | 513 | 563 | 652 |
| | | | | B.H.P. | .79 | 1.24 | 2.25 | 3.48 | 4.82 | 6.40 | 9.76 |
| 48 | 38 | 4 | 18 | C.F.M. | 6,870 | 7,940 | 9,725 | 11,255 | 12,520 | 13,800 | 15,880 |
| | | | | R.P.M. | 246 | 285 | 348 | 403 | 448 | 494 | 568 |
| | | | | B.H.P. | 1.03 | 1.60 | 2.92 | 4.52 | 6.25 | 8.35 | 12.60 |
| 54 | 42½ | 4 | 20 | C.F.M. | 8,695 | 10,050 | 12,225 | 14,200 | 15,795 | 17,400 | 20,050 |
| | | | | R.P.M. | 219 | 253 | 310 | 358 | 398 | 438 | 506 |
| | | | | B.H.P. | 1.32 | 2.03 | 3.75 | 5.75 | 7.93 | 10.50 | 16.40 |
| 60 | 47 | 6 | 22 | C.F.M. | 10,720 | 12,450 | 15,280 | 17,580 | 19,650 | 21,500 | 24,900 |
| | | | | R.P.M. | 197 | 228 | 279 | 322 | 360 | 394 | 456 |
| | | | | B.H.P. | 1.64 | 2.52 | 4.65 | 7.10 | 9.90 | 13.0 | 20.02 |
| 66 | 51½ | 6 | 24 | C.F.M. | 13,000 | 15,050 | 18,300 | 21,280 | 23,620 | 26.100 | 30,100 |
| | | | | R.P.M. | 179 | 207 | 253 | 293 | 326 | 359 | 414 |
| | | | | B.H.P. | 1.98 | 3.04 | 5.55 | 8.55 | 11.90 | 15.90 | 24.40 |
| 72 | 56 | 6 | 26 | C.F.M. | 15,410 | 17,850 | 21,900 | 25,180 | 28.100 | 30,900 | 35,600 |
| | | | | R.P.M. | 164 | 190 | 233 | 268 | 299 | 329 | 379 |
| | | | | B.H.P. | 2.34 | 3.62 | 6.66 | 10.20 | 14.30 | 19.0 | 28.80 |
| 84 | 65½ | 8 | 30 | C.F.M. | 21,150 | 24,400 | 29.730 | 34,400 | 38,400 | 42,200 | 48,700 |
| | | | | R.P.M. | 141 | 163 | 199 | 230 | 257 | 282 | 325 |
| | | | | B.H.P. | 3.18 | 4.92 | 8.95 | 13.90 | 19.40 | 25.50 | 39.20 |
| 96 | 74½ | 8 | 34 | C.F.M. | 27,400 | 31,820 | 38,730 | 44,750 | 49,800 | 55,200 | 63,520 |
| | | | | R.P.M. | 123 | 143 | 174 | 261 | 224 | 247 | 285 |
| | | | | B.H.P. | 4.12 | 6.40 | 11.55 | 18.0 | 24.90 | 33.20 | 50.5 |
| 108 | 83½ | 10 | 38 | C.F.M. | 34,600 | 40,200 | 49,300 | 56,900 | 63,550 | 69,650 | 80,400 |
| | | | | R.P.M. | 109 | 127 | 155 | 179 | 200 | 219 | 253 |
| | | | | B.H.P. | 5.23 | 8.16 | 14.75 | 22.80 | 31.80 | 42.0 | 64.0 |
| 120 | 93 | 10 | 42 | C.F.M. | 42,850 | 49,300 | 60,600 | 70,300 | 78,600 | 85,800 | 98,600 |
| | | | | R.P.M. | 99 | 114 | 146 | 161 | 180 | 197 | 227 |
| | | | | B.H.P. | 6.63 | 10.0 | 18.60 | 28.30 | 39.50 | 51.50 | 78.00 |
| 132 | 102 | 12 | 48 | C.F.M. | 51,950 | 60,150 | 73500 | 83,420 | 94,480 | 104,400 | 120,400 |
| | | | | R.P.M. | 90 | 104 | 127 | 146 | 163 | 179 | 207 |
| | | | | B.H.P. | 7.80 | 12.20 | 22.0 | 33.40 | 46.50 | 61.60 | 95.30 |
| 144 | 111 | 12 | 54 | C.F.M. | 61,600 | 71,400 | 87,200 | 101.120 | 112,400 | 123.200 | 142,400 |
| | | | | R.P.M. | 82 | 95 | 116 | 134 | 150 | 164 | 190 |
| | | | | B.H.P | 9.28 | 14.40 | 26.40 | 43.30 | 57.60 | 74.50 | 116.00 |

# The B&B Line of Massachusetts Cone Fans

## Capacities of Massachusetts Cone Fans

## Free Outlet, Restricted Inlet

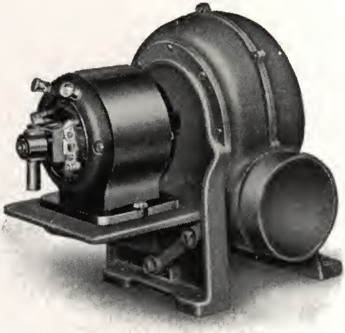
**Dynamic Pressure in Inches of Water Gauge**
For static pressure deduct 26.2%
For velocity pressure deduct 73.8%

Fan exhausting from plenum chamber to which ducts convey air from various rooms.

| Diameter of Wheel | Dia. Inlet | Pulley | | FREE OUTLET, RESTRICTED INLET | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Face | Dia. | Press | .324 in. | .433 in. | .649 in. | .865 in. | 1.08 in. | 1.30 in. | 1.73 in. |
| | | | | P. V. | 2870 | 3315 | 4075 | 4710 | 5250 | 5760 | 6660 |
| 24 | 20 | 4 | 10 | C.F.M. | 1,990 | 2,300 | 2,815 | 3,250 | 3,620 | 3,985 | 4,590 |
| | | | | R.P.M. | 457 | 529 | 648 | 750 | 837 | 920 | 1,060 |
| | | | | B.H.P. | .21 | .32 | .58 | .89 | 1.25 | 1.65 | 2.5 |
| 30 | 24½ | 4 | 12 | C.F.M. | 3,095 | 3,580 | 4,380 | 5,070 | 5,660 | 6,225 | 7,200 |
| | | | | R.P.M. | 366 | 423 | 518 | 600 | 667 | 735 | 850 |
| | | | | B.H.P. | .32 | .50 | .91 | 1.4 | 1.95 | 2.60 | 3.95 |
| 36 | 29 | 4 | 14 | C.F.M. | 4,485 | 5,180 | 6,360 | 7,340 | 8,200 | 8,995 | 10,380 |
| | | | | R.P.M. | 305 | 353 | 433 | 500 | 557 | 612 | 708 |
| | | | | B.H.P. | .46 | .71 | 1.32 | 2.02 | 2.83 | 3.72 | 5.7 |
| 42 | 33½ | 4 | 16 | C.F.M. | 6,090 | 7,040 | 8,640 | 9,960 | 11,135 | 12,200 | 14,080 |
| | | | | R.P.M. | 261 | 303 | 371 | 428 | 477 | 525 | 606 |
| | | | | B.H.P. | .63 | .97 | 1.79 | 2.74 | 3.9 | 5.1 | 7.7 |
| 48 | 38 | 4 | 18 | C.F.M. | 7,950 | 9,200 | 11,300 | 13,050 | 14,570 | 15,960 | 18,420 |
| | | | | R.P.M. | 229 | 265 | 325 | 375 | 418 | 458 | 530 |
| | | | | B.H.P. | .81 | 1.27 | 2.34 | 3.6 | 5.0 | 6.6 | 10.1 |
| 54 | 42½ | 4 | 20 | C.F.M. | 10,080 | 11,610 | 14,230 | 16,415 | 18,375 | 20,175 | 23,225 |
| | | | | R.P.M. | 203 | 235 | 289 | 333 | 372 | 408 | 470 |
| | | | | B.H.P. | 1.05 | 1.6 | 2.95 | 4.55 | 6.3 | 8.35 | 12.7 |
| 60 | 47 | 6 | 22 | C.F.M. | 12,420 | 14,350 | 17,590 | 20,350 | 22,680 | 24,875 | 28,700 |
| | | | | R.P.M. | 183 | 212 | 259 | 300 | 335 | 368 | 423 |
| | | | | B.H.P. | 1.3 | 1.97 | 3.64 | 5.78 | 7.8 | 10.3 | 15.75 |
| 66 | 51½ | 6 | 24 | C.F.M. | 14,920 | 17,380 | 21,275 | 24,585 | 27,380 | 30,100 | 34,620 |
| | | | | R.P.M. | 166 | 193 | 237 | 273 | 304 | 335 | 385 |
| | | | | B.H.P. | 1.57 | 2.4 | 4.42 | 6.78 | 9.38 | 12.5 | 19.9 |
| 72 | 56 | 6 | 26 | C.F.M. | 17,900 | 20,670 | 25,470 | 29,220 | 32,690 | 35,800 | 41.450 |
| | | | | R.P.M. | 153 | 176 | 217 | 250 | 278 | 306 | 353 |
| | | | | B.H.P. | 1.85 | 2.84 | 5.27 | 8.05 | 11.3 | 14.8 | 22.7 |
| 84 | 65½ | 8 | 30 | C.F.M. | 24,300 | 28,200 | 34,450 | 39,700 | 44,275 | 48,700 | 56,400 |
| | | | | R.P.M. | 131 | 152 | 186 | 214 | 238 | 263 | 303 |
| | | | | B.H.P. | 2.54 | 3.88 | 7.15 | 11.0 | 15.4 | 20.2 | 31.0 |
| 96 | 74½ | 8 | 34 | C.F.M. | 31.575 | 36,800 | 44,775 | 51,750 | 57,800 | 63,600 | 73,300 |
| | | | | R.P.M. | 114 | 133 | 162 | 187 | 209 | 230 | 265 |
| | | | | B.H.P. | 3.32 | 5.05 | 9.35 | 14.2 | 20.0 | 26.4 | 40.3 |
| 108 | 83½ | 10 | 38 | C.F.M. | 40,300 | 46,650 | 56,700 | 65,800 | 73,000 | 80,600 | 93,200 |
| | | | | R.P.M. | 102 | 118 | 144 | 167 | 185 | 204 | 236 |
| | | | | B.H.P. | 4.2 | 6.4 | 11.8 | 18.1 | 25.4 | 33.4 | 51.0 |
| 120 | 93 | 10 | 42 | C.F.M. | 49,750 | 57,500 | 70,400 | 81,350 | 90,650 | 99,200 | 115,000 |
| | | | | R.P.M. | 92 | 106 | 130 | 150 | 167 | 183 | 212 |
| | | | | B.H.P. | 5.15 | 7.9 | 14.6 | 22.4 | 31.2 | 41.2 | 63.0 |
| 132 | 102 | 12 | 48 | C.F.M. | 59,500 | 69,500 | 84,650 | 97,500 | 108,000 | 119,800 | 137,500 |
| | | | | R.P.M. | 83 | 97 | 118 | 136 | 152 | 167 | 192 |
| | | | | B.H.P. | 6.25 | 9.57 | 17.6 | 27.0 | 37.0 | 50.5 | 74.8 |
| 144 | 111 | 12 | 54 | C.F.M. | 71,400 | 82,700 | 101,500 | 117,500 | 130,800 | 143,800 | 165,400 |
| | | | | R.P.M. | 76 | 88 | 108 | 125 | 139 | 153 | 176 |
| | | | | B.H.P | 7.45 | 11.35 | 21.05 | 32.3 | 45.0 | 59.5 | 90.5 |

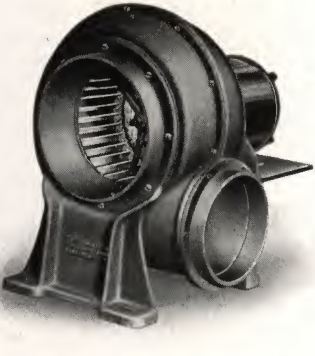
# The B&B Line of Massachusetts Portable Service Sets

The Massachusetts Portable Service Sets are small squirrel cage fans ranging in size from 6-inch to 15-inch diameter wheel. The fans are built for either belt drive or direct connection to motors and are so designed that the wheel is overhung, thus giving a free and unobstructed inlet. They are of service for the ventilation of toilets, offices, residences, waiting rooms, laboratories, etc.



**Portable Service Set with Direct Connected Motor**

The housings and supports of these fans are of cast iron and may be arranged for either right or left hand discharge as the case may require. On direct connected sets the motors commonly employed operate at 1750 r.p.m. for the smaller sizes and at approximately 550 r.p.m. for the larger fans. Speed at which these units operate is naturally determined by the conditions of installation.



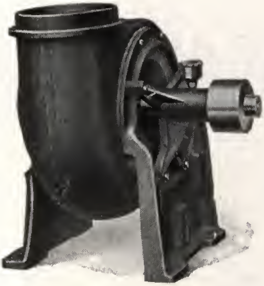
**Inlet Side, Portable Service Set.**

# The B&B Line of Massachusetts Portable Service Sets

Single phase, polyphase, alternating current or direct current motors can be supplied with Massachusetts Portable Service Sets Speed regulators can be furnished with direct current motors, conveniently mounted along side the motor driving the fan. These blowers are exceptionally quiet in operation at high speeds.

In considering any fan problem it is desirable to know the following elements:

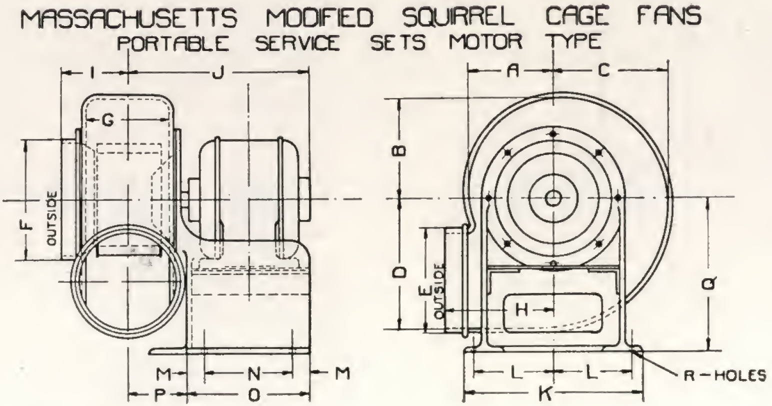
1. Volume of air the fan is to deliver.
2. Resistance or static pressure that the fan will operate against.
3. The temperature of the air it will handle, especially if it is over 100 degrees Fahrenheit.
4. The type of motive power most advisable, alternating current motor, direct current motor, or belt drive.
5. Restrictions as to space that the fan can occupy.
6. Restrictions as to the power supply.



The Massachusetts Portable Service Sets are very useful for service on doubtful problems, their size and portability allow the user to install on a ventilating problem of temporary consideration, and to use these sets either permanently or temporarily as required.

The capacities and power requirements for the B&B Line of Massachusetts Portable Service Sets are shown in Table of Capacities on the following page.

# The B&B Line of Massachusetts Portable Service Sets


MASSACHUSETTS MODIFIED SQUIRREL CAGE FANS
PORTABLE SERVICE SETS MOTOR TYPE
I
J
G
F
OUTSIDE
M
N
M
P
O
A
C
B
D
E
OUTSIDE
H
Q
L
L
K
R-HOLES

| Size Fan | W'le Dia. | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | Wt. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60-00 | 6″ | 3 15/16 | 4⅝ | 5 5/16 | 6 | 4 11/16 | 6 7/16 | 4 | 5 9/16 | 3 | 11 5/16 | 10½ | 4⅝ | 1¼ | 5½ | 8 | 3 5/16 | 8 | 9/16 | 75 |
| 00-81 | 8¼ | 5 7/16 | 6⅜ | 7 5/16 | 8¼ | 6⅜ | 8½ | 5½ | 7 1/16 | 4 9/16 | 13 1/16 | 12⅝ | 5 11/16 | 1¼ | 6½ | 9 | 4 1/16 | 10 | 9/16 | 100 |
| 0-10½ | 10½ | 7⅛ | 8½ | 9⅞ | 11¼ | 8 11/16 | 11⅝ | 7 | 8¾ | 5⅜ | 15½ | 15¾ | 7¼ | 1½ | 7½ | 10½ | 5 | 13 | 9/16 | 185 |
| 0-12 | 12 | 7⅞ | 9⅝ | 11⅜ | 13⅛ | 10 | 13 | 8 | 9½ | 5⅞ | 17⅝ | 17 15/16 | 8 3/16 | 1½ | 9 | 12 | 5⅝ | 13⅝ | 9/16 | 220 |
| 0-15 | 15 | 9¾ | 12 | 14¼ | 16½ | 12½ | 16 | 10 | 11¾ | 7 3/16 | 18¾ | 21⅝ | 10 | 1½ | 9 | 12 | 6¾ | 18½ | 9/16 | 330 |

## The B&B Line of Massachusetts Portable Service Sets

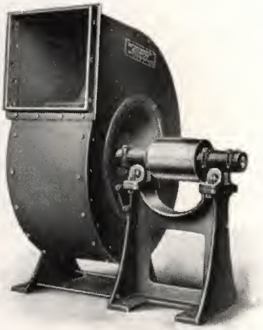
# CAPACITY TABLES OF PORTABLE SERVICE SETS

| Size Fan | RPM | Free Delivery | | ⅛″ Static | | ¼″ Static | | ½″ Static | | ¾″ Static | | 1″ Static | | 1½″ Static | | 2″ Static | | 2½″ Static | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CFM | BHP | CFM | BHP | CFM | BHP | CFM | BHP | CFM | BHP | CFM | BHP | CFM | BHP | CFM | BHP | CFM | BHP |
| 00–60 | 1150 | 216 | .024 | 175 | .018 | 133 | .014 | 20 | .008 | | | | | | | | | | |
| | 1750 | 330 | .083 | 310 | .078 | 275 | .067 | 215 | .05 | 158 | .042 | 40 | .028 | | | | | | |
| | 2250 | 422 | .185 | 400 | .180 | 380 | .170 | 340 | .145 | 285 | .12 | 250 | .105 | 117 | .07 | | | | |
| 00–81 | 850 | 415 | .05 | 345 | .038 | 260 | .028 | 25 | .018 | | | | | | | | | | |
| | 1150 | 560 | .12 | 515 | .11 | 455 | .095 | 325 | .07 | 146 | .05 | | | | | | | | |
| | 1750 | 850 | .41 | 780 | .39 | 780 | .37 | 700 | .33 | 630 | .29 | 560 | .25 | 390 | .19 | 70 | .15 | | |
| 0–10½ | 700 | 800 | .12 | 730 | .10 | 620 | .081 | 300 | .06 | | | | | | | | | | |
| | 850 | 1120 | .21 | 920 | .19 | 820 | .17 | 720 | .13 | 565 | .11 | 300 | .08 | | | | | | |
| | 1150 | 1310 | .48 | 1260 | .46 | 1210 | .45 | 1110 | .39 | 840 | .34 | 710 | .31 | 410 | .24 | | | | |
| | 1750 | 2230 | 1.96 | 2100 | 1.89 | 1920 | 1.70 | 1860 | 1.72 | 1740 | 1.56 | 1690 | 1.42 | 1080 | .85 | 635 | .77 | | |
| 0–12 | 700 | 1260 | .20 | 1090 | .17 | 935 | .14 | 580 | .095 | | | | | | | | | | |
| | 850 | 1525 | .37 | 1470 | .34 | 1280 | .30 | 1000 | .23 | 670 | .165 | | | | | | | | |
| | 1150 | 2070 | .90 | 2000 | .88 | 1950 | .83 | 1700 | .70 | 1450 | .63 | 1245 | .53 | 662 | .36 | | | | |
| | 1750 | 3150 | 3.20 | 3100 | 3.17 | 3000 | 3.10 | 2950 | 3.0 | 2825 | 2.85 | 2640 | 2.56 | 2400 | 2.3 | 2100 | 2.0 | 1790 | 1.73 |
| 0–15 | 700 | 2470 | .63 | 2320 | .580 | 2070 | .50 | 1675 | .39 | 1200 | .30 | 320 | .215 | | | | | | |
| | 850 | 3000 | 1.15 | 2850 | 1.12 | 2730 | 1.04 | 2310 | .83 | 2080 | .73 | 1620 | .585 | 330 | .37 | | | | |
| | 1150 | 4050 | 2.8 | 4000 | 2.78 | 3880 | 2.65 | 3630 | 2.50 | 3350 | 2.20 | 3100 | 1.96 | 2580 | 1.65 | 1970 | 1.35 | 970 | 1.0 |

# The B&B Line of Massachusetts Exhausters

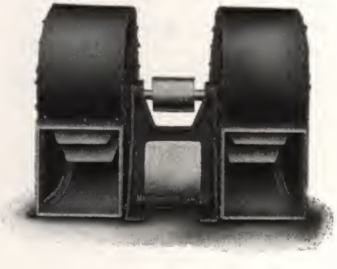
The Massachusetts Exhausters are designed for the handling of materials such as shavings, sawdust, emery dust, grains, etc. The housings are of extra heavy steel plate to withstand the abrasive action of the material handled. The construction of the wheel permits of the handling of long, stringy materials without clogging.

The wheel is overhung on the end of the shaft, thus leaving the inlet entirely unobstructed for the free passage of the material to be handled. There are no exposed bearings, hence the Massachusetts Exhausters are well adapted for other service than handling materials such as hot air, smoke and steam.



**Single Exhaust Type**

The Massachusetts Exhausters are of the universal type, interchangeable for any hand and discharge, and are made both in single and double designs. The double type of planing mill exhauster is used where the piping extends in opposite directions. It permits of direct connection to the inlets without the use of elbows.



**Double Type**

# The B&B Line of Massachusetts Exhausters

In the design of an exhausting system the exhauster should be placed as near to the heaviest work as practical, and at the same time be located to serve all the machines to which it may be connected. If the machines are far apart it is better to increase the number of exhausters. When the duct branches exceed 50 or 60 feet in length it is far better design to use an extra exhauster and avoid such distances and to give consideration to double exhausters.

The power required to produce a required suction throughout any exhaust system depends upon the total resistance of the system and the efficiency of the exhauster. The resistance encountered is represented in the following elements:

1. The resistance due to pipe friction.
2. The loss at junctions of the pipes.
3. The back pressure imposed by a collector.

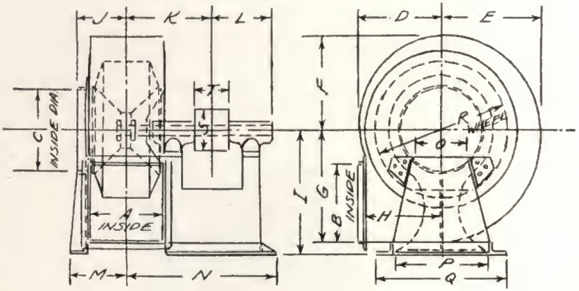
Consideration must in turn be given of the physical nature of the materials handled, not so much for the resistance imposed but from an abrasive and clogging viewpoint. Thus experience alone can give definite information and design exhausting systems for shavings and sawdust, emery dust, leather chips, leather dust, buffing wheel lint, grains, powdered chemicals, etc., etc. The Massachusetts Exhausters have been designed with such information at their disposal.

The Massachusetts Exhauster construction is for strength and racking is prevented, unusually long life is assured even in contact with highly abrasive materials. The cast iron support used on the single type, attached to the outside of the shell carries the ring oiling boxes with the shaft and pulley, thereby taking the entire strain on the mechanism. On the double type these supports are located between the two units

# The B&B Line of Massachusetts Exhausters

## Dimensions

### Massachusetts Single Exhausters



| Size Fan | Shaft Dia. | A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | 1 3/16 | 11 | 11 | 12 | 12½ | 15 | 13¾ | 16¼ | 11¾ | 18 | 7¼ |
| 35 | 1 7/16 | 13 | 13 | 13¾ | 14½ | 17½ | 16 | 19 | 13½ | 20⅞ | 8⅝ |
| 40 | 1 11/16 | 14¼ | 14¼ | 15⅝ | 16½ | 20 | 18¼ | 21¾ | 15 | 23¾ | 9¼ |
| 45 | 1 11/16 | 16 | 16 | 17⅝ | 18½ | 22½ | 20½ | 24½ | 17 | 26¾ | 10¼ |
| 50 | 1 15/16 | 17¾ | 17¾ | 19¾ | 20½ | 25 | 22¾ | 27¼ | 18½ | 29⅞ | 11⅛ |
| 55 | 2 3/16 | 19½ | 19½ | 21⅝ | 22½ | 27½ | 25 | 30 | 20½ | 32¾ | 12 |
| 60 | 2 3/16 | 21¼ | 21¼ | 23⅝ | 25 | 30½ | 27¾ | 33¼ | 22½ | 35¾ | 12⅞ |

| Size Fan | Shaft Dia. | K | L | M | N | O | P | Q | R | S | T |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | 1 3/16 | 12¾ | 8¾ | 8¾ | 20 | 7 | 14 | 16 | 20 | 6 | 5 |
| 35 | 1 7/16 | 15 | 10½ | 9¾ | 26¼ | 9 | 15⅞ | 23 | 23 | 7 | 6 |
| 40 | 1 11/16 | 16¾ | 12¼ | 11⅜ | 29⅛ | 9 | 17¾ | 24¼ | 27 | 8 | 7 |
| 45 | 1 11/16 | 19¼ | 14 | 12¼ | 33¾ | 10 | 20¼ | 27 | 30 | 9 | 8 |
| 50 | 1 15/16 | 20⅝ | 14½ | 13⅛ | 35⅝ | 10 | 22¾ | 29 | 33 | 10 | 9 |
| 55 | 2 3/16 | 22½ | 16 | 14 | 39 | 10 | 24¾ | 31½ | 36 | 11 | 10 |
| 60 | 2 3/16 | 23⅞ | 16½ | 14⅞ | 40⅞ | 10 | 26¾ | 33 | 40 | 12 | 11 |

# The B&B Line of Massachusetts Exhausters

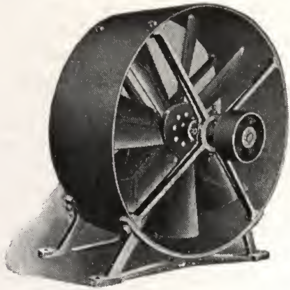
CAPACITIES, SPEEDS AND HORSE POWERS OF MASSACHUSETTS STANDARD PLANING MILL EXHAUST FANS

| Size of Fan | Dia. of Wheel | Inside Dia. Inlet | Size Outlet | Pulley | | Static Preasure | ½ oz. .865" | ¾ oz. 1.297" | 1 oz. 1.73" | 1½ oz. 2.595" | 2 oz. 3.46" | 2½ oz. 4.325" | 3 oz. 5.19" | 3½ oz. 6.055" | 4 oz. 6.92" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Face | Dia. | P.V. | 4360 | 5340 | 6170 | 7560 | 8720 | 9760 | 10750 | 11600 | 12350 |
| 30 | 20 | 12 | 11 x 11 | 5 | 6 | R.P.M. | 835 | 1,025 | 1.180 | 1,442 | 1.670 | 1,870 | 2,041 | 2,210 | 2,360 |
| | | | | | | C.F.M. | 1,330 | 1,610 | 1,860 | 2,280 | 2.630 | 2,940 | 3,220 | 3,480 | 3,720 |
| | | | | | | B.H.P. | .45 | .83 | 1.25 | 2.25 | 3.55 | 4.9 | 6.4 | 8.2 | 10.0 |
| 35 | 23 | 13¾ | 13 x 13 | 6 | 7 | R.P.M. | 726 | 888 | 1,025 | 1,256 | 1,450 | 1,622 | 1,776 | 1.918 | 2,050 |
| | | | | | | C.F.M. | 1,850 | 2,270 | 2,620 | 3,210 | 3,700 | 4.140 | 4,540 | 4,900 | 5,240 |
| | | | | | | B.H.P. | .62 | 1.14 | 1.75 | 3.23 | 4.95 | 6.93 | 9.1 | 11.4 | 14.0 |
| 40 | 27 | 15⅝ | 14¼ x 14¼ | 7 | 8 | R.P.M. | 618 | 756 | 873 | 1,070 | 1,235 | 1,380 | 1,512 | 1,632 | 1,745 |
| | | | | | | C.F.M. | 2,300 | 2,830 | 3,250 | 3,980 | 4,600 | 5,140 | 5,630 | 6,080 | 6,500 |
| | | | | | | B.H.P. | .78 | 1.43 | 2.2 | 4.05 | 6.25 | 8.7 | 11.4 | 14.4 | 17.6 |
| 45 | 30 | 17⅝ | 16 x 16 | 8 | 9 | R.P.M. | 555 | 680 | 785 | 962 | 1,110 | 1,240 | 1.360 | 1.470 | 1,570 |
| | | | | | | C.F.M. | 2,970 | 3,640 | 4,200 | 5,150 | 5,940 | 6,640 | 7,280 | 7,860 | 8,400 |
| | | | | | | B.H.P. | 1.05 | 1.86 | 2.85 | 5.25 | 8.1 | 11.3 | 14.9 | 18.8 | 23.0 |
| 50 | 33 | 19¾ | 17¾ x 17¾ | 9 | 10 | R.P.M. | 505 | 618 | 714 | 874 | 1,010 | 1.130 | 1,237 | 1,336 | 1.430 |
| | | | | | | C.F.M. | 3.710 | 4.550 | 5,250 | 6,430 | 7,420 | 8,300 | 9.100 | 9,820 | 10.500 |
| | | | | | | B.H.P. | 1.25 | 2.3 | 3.53 | 6.5 | 10.0 | 14.0 | 18.4 | 23.2 | 28.5 |
| 55 | 36 | 21⅝ | 19½ x 19½ | 10 | 11 | R.P.M. | 464 | 566 | 654 | 802 | 925 | 1,004 | 1,134 | 1,224 | 1,310 |
| | | | | | | C.F.M. | 4,570 | 5,600 | 6,470 | 7,920 | 9,150 | 10,230 | 11,200 | 12,100 | 12,950 |
| | | | | | | B.H.P. | 1.55 | 2.82 | 4.35 | 8.05 | 12.3 | 15.8 | 22.7 | 28.5 | 35.0 |
| 60 | 40 | 23⅝ | 21¼ x 21¼ | 11 | 12 | R.P.M | 417 | 510 | 590 | 723 | 835 | 932 | 1.022 | 1,100 | 1,180 |
| | | | | | | C.F.M. | 5,480 | 6,700 | 7,740 | 9,480 | 10.950 | 12,250 | 13.420 | 14,500 | 15,500 |
| | | | | | | B.H.P. | 1.84 | 3.36 | 5.2 | 9.6 | 14.8 | 20.5 | 27.0 | 33.8 | 41.5 |

# The B&B Line of Massachusetts Disc Fans

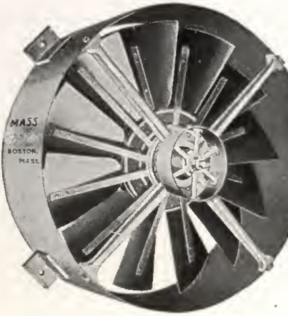
Massachusetts Disc Fans are recommended for moving large volumes of air at low pressures. They should not be installed with any great length of duct system. They are strongly built, self contained ventilating units, easily installed and easily moved from one location to another. They are correctly designed and built to withstand the most service in the industrial fields. For mining work they are of more than ordinary consideration and service.

A Massachusetts Disc Fan consists of a substantial hub into which are cast radial steel arms to which the steel plate blades are rigidly attached. The independent wheel is enclosed in a substantial circular frame, having two self oiling bearings, pulley and supporting feet as illustrated below. Wall and floor mountings can be furnished if required, and as illustrated in the cuts.



**Floor Mounting**

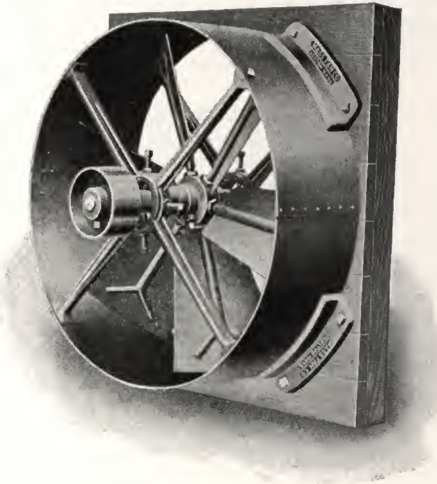
The inclined planes of the blades force air through the fan in lines horizontal to the axis of the shaft. By reversing this angle of the blades, or the direction of rotation, the air flow is reversed. The Massachusetts Disc Fan is made for both direct or pulley drive from motor or engine. Chain or geared drives can be supplied as special equipment, and portable, direct connected units can be designed for mining and similar industrial requirements.



**Wall Mounting**

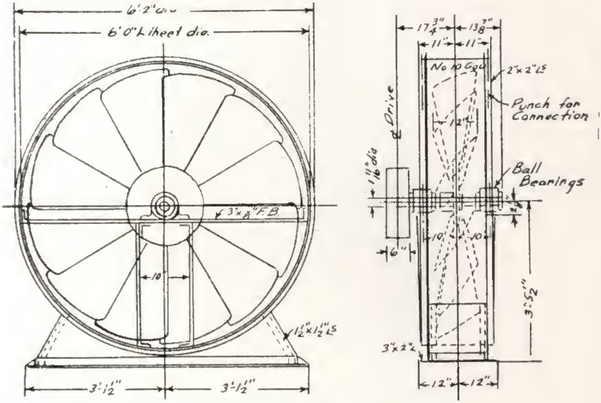
# The B&B Line of Massachusetts Disc Fans

The Massachusetts Disc Fans are of service for all exhausting and ventilating work where ducts are not required. Large volumes of air against relatively low resistance are their characteristics, and they are thus of great service in shops, offices and factories to remove foul air. Industrially they are useful in dye houses, bleacheries, paper mills, etc., to remove steam, moist air, dust and odors. They can, as illustrated, be designed to stand or set on the floor, to be mounted on a wall, or be set in board mounting for sidewall installation.



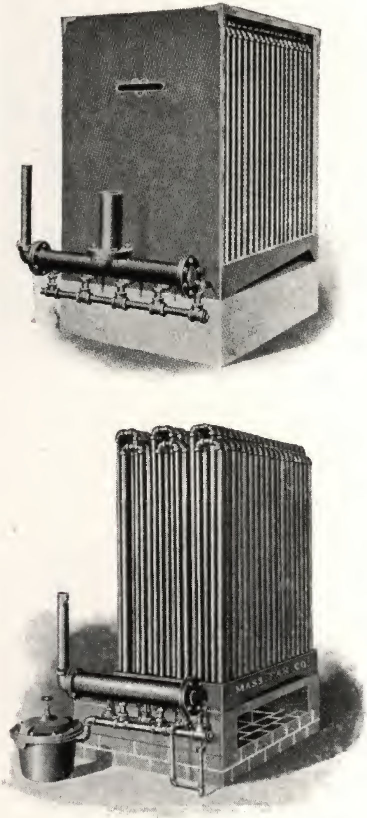
**Board Mounting**

The following cut gives typical dimensions of a Massachusetts Disc Fan, for ventilation service.



# The B&B Line of Massachusetts Pipe Coil Heaters

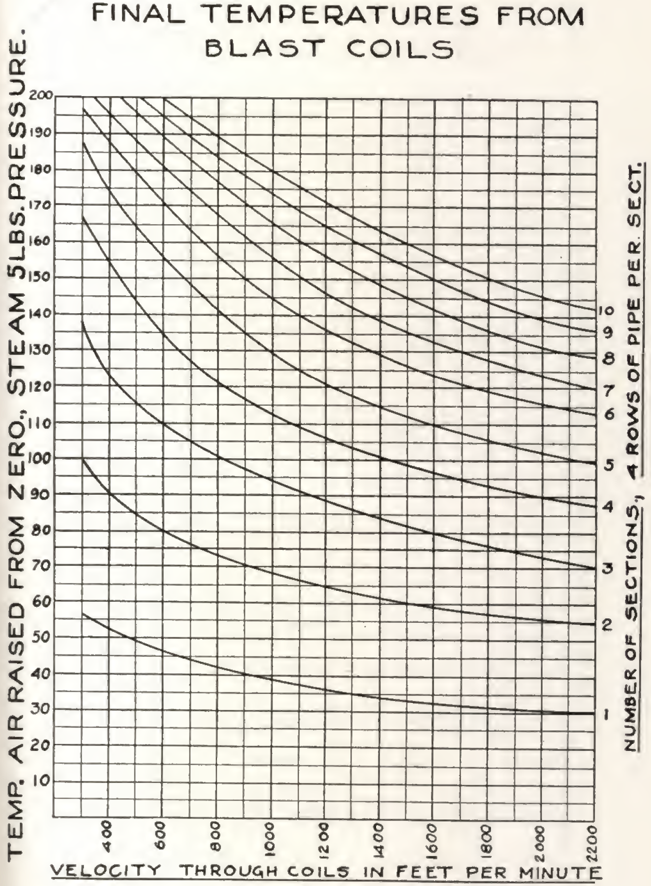
The Massachusetts Pipe Coil Heaters, often known as Return Bend Heaters, are popular for hot blast heating, drying, and similar usage, because of their great efficiency. In these heaters the pipes are spaced further apart than in the mitre coil and other types of pipe coil heaters, thus giving a large free area for the flow of air. The pipes being staggered insures of the thorough breaking up of air currents, better contact of the air with the heating surface results, and the combination of free passage and thorough heating of the air takes place.



**Exterior and Interior of Pipe Coil Heater**

# The B&B Line of Massachusetts Pipe Coil Heaters

The temperature rise in air passing through Massachusetts Standard Pipe Coil Heaters for various conditions is shown in the following curves.



FINAL TEMPERATURES FROM BLAST COILS

NOTE:-TEMPERATURE WILL INCREASE 10% IF STEAM PRESSURE IS 20 LBS. 20% FOR 40 LBS. 30% FOR 60 LBS.

# Vento Heaters
## Regular Sections—Ratings and Free Areas
### 60″Section (Steam or Water)—16 Square Feet.
### Height $60\frac{11}{16}$″. Width 9⅛″.

### For Blower Heating and Ventilating

| Number of Sections in Stack | Square Feet of Heating Surface | Equivalent in Lineal Feet 1-Inch Pipe | 5⅜″ Centers of Sections | | 5″ Centers of Sections | | 4⅝″ Centers of Sections | | Actual Weights |
|---|---|---|---|---|---|---|---|---|---|
| | | | 52% of Face | | Standard 44% of Face | | 37% of Face | | |
| | | | Net Air Space in Square Feet | Width of Stack in Inches | Net Air Space in Square Feet | Width of Stack in Inches | Net Air Space in Square Feet | Width of Stack in Inches | |
| 7 | 112.0 | 336 | 7.62 | 38 | 6.45 | 35 | 5.47 | 32 | 8.20 lbs. per sq. ft. actual<br>9 lbs. per sq. ft. shipping weight |
| 8 | 128.0 | 384 | 8.70 | 43 | 7.37 | 40 | 6.25 | 37 | |
| 9 | 144.0 | 432 | 9.77 | 48 | 8.29 | 45 | 7.03 | 42 | |
| 10 | 160.0 | 480 | 10.85 | 54 | 9.21 | 50 | 7.81 | 46 | |
| 11 | 176.0 | 528 | 11.93 | 59 | 10.13 | 55 | 8.59 | 51 | |
| 12 | 192.0 | 576 | 13.00 | 65 | 11.05 | 60 | 9.37 | 55 | |
| 13 | 208.0 | 624 | 14.08 | 70 | 11.97 | 65 | 10.15 | 60 | |
| 14 | 224.0 | 672 | 15.15 | 75 | 12.89 | 70 | 10.93 | 65 | |
| 15 | 240.0 | 720 | 16.23 | 81 | 13.81 | 75 | 11.71 | 69 | |
| 16 | 256.0 | 768 | 17.31 | 86 | 14.73 | 80 | 12.49 | 74 | |
| 17 | 272.0 | 816 | 18.39 | 91 | 15.65 | 85 | 13.27 | 79 | |
| 18 | 288.0 | 864 | 19.46 | 97 | 16.57 | 90 | 14.05 | 83 | |
| 19 | 304.0 | 912 | 20.54 | 102 | 17.50 | 95 | 14.83 | 88 | |
| 20 | 320.0 | 960 | 21.62 | 108 | 18.42 | 100 | 15.61 | 92 | |
| 21 | 336.0 | 1008 | 22.70 | 113 | 19.34 | 105 | 16.39 | 97 | |
| 22 | 352.0 | 1056 | 23.78 | 118 | 20.26 | 110 | 17.17 | 102 | |
| 23 | 368.0 | 1104 | 24.85 | 124 | 21.18 | 115 | 17.95 | 106 | |
| 24 | 384.0 | 1152 | 25.93 | 129 | 22.10 | 120 | 18.73 | 111 | |

# Vento Heaters
# Regular Sections—Ratings and Free Areas

## 72″ Section (For Steam or Water)—19 Square Feet. Height $72\frac{3}{32}$″. Width $9\frac{1}{8}$″.

### For Blower Heating and Ventilating

| Number of Sections in Stack | Square Feet of Heating Surface | Equivalent in Lineal Feet 1-Inch Pipe | 5⅜″ Centers of Sections | | 5″ Centers of Sections | | 4⅝″ Centers of Sections | | Actua Weights |
|---|---|---|---|---|---|---|---|---|---|
| | | | 52% of Face | | Standard 44% of Face | | 37% of Face | | |
| | | | Net Air Space in Square Feet | Width of Stack in Inches | Net Air Space in Square Feet | Width of Stack in Inches | Net Air Space in Square Feet | Width of Stack in Inches | |
| 7 | 133 | 399 | 9.14 | 38 | 7.74 | 35 | 6.56 | 32 | 8.20 lbs. per sq. ft. actual<br>9 lbs. per sq. ft. shipping weight |
| 8 | 152 | 456 | 10.44 | 43 | 8.85 | 40 | 7.50 | 37 | |
| 9 | 171 | 513 | 11.72 | 48 | 9.95 | 45 | 8.45 | 42 | |
| 10 | 190 | 570 | 13.03 | 54 | 11.04 | 50 | 9.37 | 46 | |
| 11 | 209 | 627 | 14.31 | 59 | 12.17 | 55 | 10.30 | 51 | |
| 12 | 228 | 684 | 15.60 | 65 | 13.27 | 60 | 11.25 | 55 | |
| 13 | 247 | 741 | 16.90 | 70 | 14.35 | 65 | 12.18 | 60 | |
| 14 | 266 | 798 | 18.19 | 75 | 15.46 | 70 | 13.11 | 65 | |
| 15 | 285 | 855 | 19.49 | 81 | 16.58 | 75 | 14.06 | 69 | |
| 16 | 304 | 912 | 20.78 | 86 | 17.70 | 80 | 14.99 | 74 | |
| 17 | 323 | 969 | 22.07 | 91 | 18.78 | 85 | 15.92 | 79 | |
| 18 | 342 | 1026 | 23.34 | 97 | 19.88 | 90 | 16.86 | 83 | |
| 19 | 361 | 1083 | 24.64 | 102 | 21.00 | 95 | 17.80 | 88 | |
| 20 | 380 | 1140 | 25.95 | 108 | 22.10 | 100 | 18.73 | 92 | |
| 21 | 399 | 1197 | 27.25 | 113 | 23.20 | 105 | 19.67 | 97 | |
| 22 | 418 | 1254 | 28.52 | 118 | 24.31 | 110 | 20.60 | 102 | |
| 23 | 437 | 1311 | 29.80 | 124 | 25.40 | 115 | 21.54 | 106 | |
| 24 | 456 | 1368 | 31.10 | 129 | 26.50 | 120 | 22.47 | 111 | |

# Final Temperatures and Condensations

## Regular Section—Standard Spacing, 5″ Centers of Sections—Steam 227°, 5 lbs. Gauge.

Air entering above zero.

| Number of Stacks Deep | Temperature of Entering Air | VELOCITY THROUGH HEATER IN FEET PER MINUTE—MEASURED AT 70° | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 100 | | 120 | | 200 | | 600 | | 800 | | 1000 | | 1200 | | 1400 | | 1600 | | 1800 | | 2000 | |
| | | Final Temp. Air Leaving Heater | Cond. Lbs. per Sq. Ft. per Hour | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. |
| 1 | 20 | 87 | .43 | 83 | .48 | 75 | .70 | 58 | 1.46 | 54 | 1.75 | 51 | 1.99 | 49 | 2.23 | 47 | 2.42 | 45 | 2.56 | 43 | 2.65 | 42 | 2.82 |
| | 30 | 93 | .40 | 89 | .45 | 81 | .65 | 66 | 1.39 | 62 | 1.64 | 60 | 1.92 | 58 | 2.17 | 56 | 2.33 | 54 | 2.46 | 52 | 2.54 | 51 | 2.69 |
| | 40 | 100 | .38 | 96 | 43 | 88 | .62 | 74 | 1.31 | 70 | 1.54 | 68 | 1.80 | 66 | 2.00 | 64 | 2.16 | 62 | 2.26 | 61 | 2.42 | 60 | 2.56 |
| | 60 | 112 | .33 | 109 | .38 | 102 | .54 | 90 | 1.15 | 86 | 1.34 | 84 | 1.54 | 82 | 1.69 | 81 | 1.89 | 80 | 2.05 | 79 | 2.19 | 78 | 2.31 |
| | 70 | 118 | .31 | 115 | .35 | 109 | .50 | 97 | 1.04 | 94 | 1.23 | 92 | 1.41 | 90 | 1.54 | 89 | 1.71 | 88 | 1.85 | 87 | 1.96 | 86 | 2.05 |
| 2 | 20 | 129 | .35 | 124 | .40 | 112 | .59 | 87 | 1.29 | 81 | 1.57 | 76 | 1.80 | 72 | 2.00 | 69 | 2.20 | 66 | 2.36 | 64 | 2.54 | 62 | 2.69 |
| | 30 | 133 | .33 | 129 | .38 | 117 | .56 | 93 | 1.21 | 87 | 1.46 | 83 | 1.70 | 79 | 1.89 | 76 | 2.06 | 73 | 2.21 | 71 | 2.37 | 69 | 2.50 |
| | 40 | 137 | .31 | 133 | .36 | 121 | .52 | 100 | 1.15 | 94 | 1.39 | 90 | 1.60 | 86 | 1.77 | 83 | 1.93 | 81 | 2.10 | 79 | 2.27 | 77 | 2.37 |
| | 60 | 145 | .27 | 142 | .32 | 131 | .46 | 112 | 1.00 | 107 | 1.21 | 103 | 1.38 | 100 | 1.54 | 98 | 1.71 | 96 | 1.85 | 94 | 1.96 | 92 | 2.05 |
| | 70 | 149 | .25 | 146 | .29 | 136 | .42 | 118 | .92 | 114 | 1.13 | 110 | 1.28 | 107 | 1.42 | 105 | 1.57 | 103 | 1.69 | 101 | 1.79 | 100 | 1.92 |
| 3 | 20 | 157 | .29 | 152 | .34 | 139 | .51 | 110 | 1.15 | 103 | 1.42 | 97 | 1.65 | 92 | 1.85 | 88 | 2.06 | 85 | 2.22 | 82 | 2.38 | 79 | 2.52 |
| | 30 | 160 | .28 | 155 | .32 | 142 | .48 | 115 | 1.09 | 108 | 1.33 | 103 | 1.56 | 98 | 1.75 | 94 | 1.91 | 91 | 2.08 | 88 | 2.23 | 85 | 2.35 |
| | 40 | 163 | .26 | 158 | .30 | 146 | .45 | 121 | 1.04 | 114 | 1.26 | 109 | 1.47 | 104 | 1.64 | 100 | 1.79 | 97 | 1.95 | 94 | 2.08 | 92 | 2.22 |
| | 60 | 168 | .23 | 164 | .27 | 153 | .40 | 131 | .91 | 124 | 1.09 | 120 | 1.28 | 116 | 1.44 | 113 | 1.58 | 110 | 1.71 | 108 | 1.85 | 106 | 1.97 |
| | 70 | 170 | .21 | 167 | .25 | 156 | .37 | 136 | .85 | 130 | 1.03 | 126 | 1.20 | 122 | 1.34 | 119 | 1.46 | 116 | 1.57 | 114 | 1.69 | 112 | 1.80 |
| 4 | 20 | ........ | ........ | ... | ... | ... | ... | 130 | 1.06 | 122 | 1.31 | 115 | 1.52 | 110 | 1.73 | 105 | 1.91 | 101 | 2.08 | 97 | 2.22 | 94 | 2.37 |
| | 30 | ........ | ........ | ... | ... | ... | ... | 134 | 1.00 | 126 | 1.23 | 120 | 1.44 | 115 | 1.63 | 110 | 1.80 | 106 | 1.95 | 102 | 2.08 | 99 | 2.21 |
| | 40 | ........ | ........ | ... | ... | ... | ... | 138 | .94 | 130 | 1.15 | 124 | 1.35 | 119 | 1.52 | 115 | 1.68 | 111 | 1.82 | 108 | 1.96 | 105 | 2.08 |
| | 60 | ........ | ........ | ... | ... | ... | ... | 146 | .83 | 139 | 1.01 | 134 | 1.19 | 129 | 1.33 | 125 | 1.46 | 122 | 1.59 | 119 | 1.70 | 117 | 1.83 |
| | 70 | ........ | ........ | ... | ... | ... | ... | 150 | .77 | 143 | .94 | 138 | 1.09 | 134 | 1.23 | 131 | 1.37 | 128 | 1.49 | 125 | 1.59 | 123 | 1.70 |

# Final Temperatures and Condensations

## Regular Section—Standard Spacing, 5" Centers of Sections—Steam, 227°, 5 lbs. Gauge Air entering above zero

| Number of Stacks Deep | Temper-ature of Entering Air | VELOCITY THROUGH HEATER IN FEET PER MINUTE—MEASURED AT 70° | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 100 | | 120 | | 200 | | 600 | | 800 | | 1000 | | 1200 | | 1400 | | 1600 | | 1800 | | 2000 | |
| | | Final Temp Air Leaving Heater | Cond. Lbs. per Sq. Ft per Hour | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. |
| 5 | 20 | | | | | | | 144 | .95 | 136 | 1.19 | 130 | 1.41 | 124 | 1.60 | 119 | 1.78 | 114 | 1.93 | 110 | 2.08 | 107 | 2.23 |
| | 30 | | | | | | | 148 | .91 | 140 | 1.13 | 134 | 1.33 | 128 | 1.51 | 123 | 1.67 | 118 | 1.80 | 115 | 1.96 | 112 | 2.10 |
| | 40 | | | | | | | 151 | .85 | 144 | 1.07 | 138 | 1.26 | 132 | 1.42 | 127 | 1.56 | 123 | 1.70 | 120 | 1.85 | 117 | 1.98 |
| | 60 | | | | | | | 158 | .75 | 151 | .93 | 145 | 1.09 | 140 | 1.23 | 136 | 1.36 | 133 | 1.50 | 130 | 1.62 | 127 | 1.72 |
| | 70 | | | | | | | 162 | .71 | 155 | .87 | 149 | 1.01 | 144 | 1.14 | 141 | 1.27 | 138 | 1.40 | 135 | 1.50 | 132 | 1.59 |
| 6 | 20 | | | | | | | 156 | .87 | 148 | 1.10 | 142 | 1.30 | 136 | 1.49 | 130 | 1.65 | 126 | 1.81 | 122 | 1.96 | 118 | 2.09 |
| | 30 | | | | | | | 159 | .83 | 151 | 1.04 | 145 | 1.23 | 139 | 1.40 | 134 | 1.56 | 130 | 1.71 | 126 | 1.85 | 122 | 1.97 |
| | 40 | | | | | | | 162 | .78 | 154 | .97 | 148 | 1.15 | 143 | 1.32 | 138 | 1.47 | 134 | 1.60 | 131 | 1.75 | 127 | 1.86 |
| | 60 | | | | | | | 167 | .69 | 160 | .85 | 155 | 1.02 | 150 | 1.15 | 146 | 1.29 | 142 | 1.40 | 139 | 1.52 | 136 | 1.62 |
| | 70 | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 20 | | | | | | | 167 | .81 | 159 | 1.02 | 152 | 1.21 | 146 | 1.39 | 141 | 1.55 | 136 | 1.70 | 132 | 1.85 | 128 | 1.98 |
| | 30 | | | | | | | 169 | .76 | 161 | .96 | 155 | 1.15 | 149 | 1.31 | 144 | 1.46 | 139 | 1.60 | 135 | 1.73 | 132 | 1.87 |
| | 40 | | | | | | | 171 | .72 | 164 | .91 | 158 | 1.08 | 153 | 1.24 | 148 | 1.39 | 143 | 1.51 | 139 | 1.63 | 136 | 1.76 |
| | 60 | | | | | | | | | | | | | | | | | | | | | | |
| | 70 | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 20 | | | | | | | 175 | .75 | 167 | .94 | 161 | 1.13 | 155 | 1.30 | 150 | 1.46 | 145 | 1.60 | 141 | 1.74 | 137 | 1.87 |
| | 30 | | | | | | | 177 | .71 | 169 | .89 | 163 | 1.07 | 158 | 1.23 | 153 | 1.38 | 148 | 1.51 | 144 | 1.64 | 140 | 1.76 |
| | 40 | | | | | | | 179 | .67 | 171 | .84 | 165 | 1.00 | 160 | 1.15 | 155 | 1.29 | 151 | 1.42 | 147 | 1.54 | 143 | 1.65 |
| | 60 | | | | | | | | | | | | | | | | | | | | | | |
| | 70 | | | | | | | | | | | | | | | | | | | | | | |

# Final Temperatures and Condensations

## Regular Section—Standard Spacing, 5″ Centers of Sections—Steam 227°, 5 lbs. Gauge.

## Air entering below zero.

| Number of Stacks Deep | Temperature of Entering Air | VELOCITY THROUGH HEATER IN FEET PER MINUTE—MEASURED AT 70° | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 100 | | 120 | | 200 | | 600 | | 800 | | 1000 | | 1200 | | 1400 | | 1600 | | 1800 | | 2000 | |
| | | Final Temp. Air Leaving Heater | Cond. Lbs. per Sq. Ft. per Hour | F. T. | C. | F. T. | C. | F. T. | C | F. T. | C | F. T | C | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. |
| 1 | -40 | 52 | .59 | 49 | .68 | 34 | .95 | ... | ... | | | | | | | | | | | | | | |
| | -30 | 58 | .56 | 55 | .65 | 41 | .91 | ... | ... | | | | | | | | | | | | | | |
| | -20 | 64 | .54 | 61 | .62 | 48 | .87 | ... | ... | ... | ... | | | | | | | | | | | | |
| | -10 | 70 | .51 | 67 | .59 | 55 | .83 | 34 | 1.69 | | | | | | | | | | | | | | |
| | 0 | 76 | .49 | 73 | .56 | 62 | .79 | 43 | 1.65 | 38 | 1.95 | 35 | 2.24 | 32 | 2.46 | | | | | | | | |
| 2 | -40 | 105 | .47 | 100 | .54 | 83 | .79 | 51 | 1.75 | 43 | 2.13 | 36 | 2.44 | ... | ... | | | | | | | | |
| | -30 | 109 | .45 | 104 | .52 | 88 | .76 | 57 | 1.67 | 49 | 2.03 | 43 | 2.34 | 38 | 2.62 | 34 | 2.87 | | | | | | |
| | -20 | 113 | .43 | 108 | .49 | 93 | .72 | 63 | 1.60 | 55 | 1.92 | 49 | 2.22 | 44 | 2.46 | 40 | 2.69 | 37 | 2.92 | 34 | 3.12 | 31 | 3.27 |
| | -10 | 117 | .41 | 112 | .47 | 97 | .69 | 69 | 1.52 | 62 | 1.85 | 56 | 2.12 | 51 | 2.35 | 47 | 2.56 | 44 | 2.77 | 41 | 2.94 | 38 | 3.08 |
| | 0 | 121 | .39 | 116 | .45 | 102 | .65 | 75 | 1.44 | 68 | 1.74 | 62 | 1.99 | 58 | 2.23 | 54 | 2.42 | 51 | 2.62 | 48 | 2.77 | 46 | 2.95 |
| 3 | -40 | 140 | .38 | 136 | .45 | 119 | .68 | 81 | 1.55 | 72 | 1.91 | 64 | 2.22 | 58 | 2.51 | 53 | 2.78 | 48 | 3.01 | 44 | 3.23 | 40 | 3.42 |
| | -30 | 143 | .37 | 139 | .43 | 122 | .65 | 86 | 1.49 | 77 | 1.83 | 70 | 2.14 | 64 | 2.41 | 58 | 2.63 | 54 | 2.87 | 50 | 3.08 | 46 | 3.24 |
| | -20 | 146 | .35 | 142 | .42 | 125 | .62 | 91 | 1.42 | 82 | 1.74 | 75 | 2.03 | 69 | 2.28 | 64 | 2.51 | 59 | 2.70 | 55 | 2.88 | 52 | 3.08 |
| | -10 | 149 | .34 | 145 | .40 | 129 | .59 | 96 | 1.36 | 87 | 1.66 | 80 | 1.92 | 75 | 2.18 | 70 | 2.39 | 66 | 2.60 | 62 | 2.77 | 58 | 2.90 |
| | 0 | 152 | .33 | 148 | .38 | 132 | .56 | 101 | 1.30 | 93 | 1.59 | 86 | 1.84 | 81 | 2.08 | 76 | 2.27 | 72 | 2.46 | 68 | 2.62 | 65 | 2.78 |
| 4 | -40 | ... | ... | ... | ... | ... | ... | 106 | 1.40 | 95 | 1.73 | 87 | 2.04 | 80 | 2.31 | 74 | 2.56 | 68 | 2.77 | 63 | 2.97 | 59 | 3.17 |
| | -30 | ... | ... | ... | ... | ... | ... | 110 | 1.35 | 99 | 1.65 | 91 | 1.94 | 85 | 2.21 | 79 | 2.45 | 73 | 2.64 | 68 | 2.83 | 64 | 3.11 |
| | -20 | ... | ... | ... | ... | ... | ... | 114 | 1.29 | 103 | 1.58 | 96 | 1.86 | 90 | 2.12 | 84 | 2.34 | 78 | 2.51 | 74 | 2.71 | 70 | 2.88 |
| | -10 | ... | ... | ... | ... | ... | ... | 117 | 1.22 | 108 | 1.51 | 101 | 1.78 | 95 | 2.02 | 89 | 2.22 | 84 | 2.41 | 80 | 2.60 | 76 | 2.76 |
| | 0 | ... | ... | ... | ... | ... | ... | 121 | 1.16 | 113 | 1.45 | 106 | 1.70 | 100 | 1.92 | 95 | 2.13 | 90 | 2.31 | 86 | 2.48 | 82 | 2.63 |

# Final Temperatures and Condensations

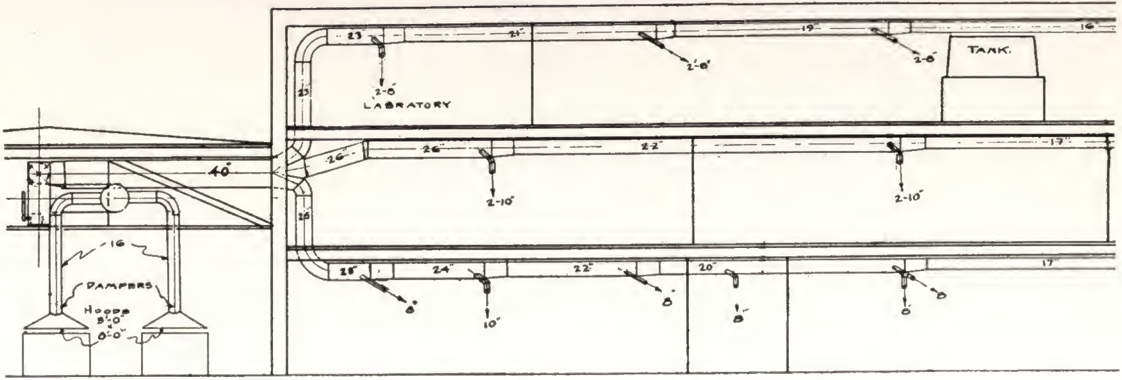
### Regular Section—Standard Spacing, 5″ Centers of Sections—Steam 227°, 5 lbs. Gauge. Air entering below zero.

| Number of Stacks Deep | Temperature of Entering Air | VELOCITY THROUGH HEATER IN FEET PER MINUTE—MEASURED AT 70° | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 100 | | 120 | | 200 | | 600 | | 800 | | 1000 | | 1200 | | 1400 | | 1600 | | 1800 | | 2000 | |
| | | Final Temp. Air Leaving Heater | Cond. Lbs. per Sq. Ft. per Hour | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. | F. T. | C. |
| 5 | -40 | ........ | ........ | ... | ... | ... | ... | 126 | 1.26 | 115 | 1.59 | 106 | 1.87 | 99 | 2.14 | 92 | 2.37 | 86 | 2.58 | 81 | 2.79 | 76 | 2.98 |
| | -30 | ........ | ........ | ... | ... | ... | ... | 129 | 1.22 | 119 | 1.53 | 110 | 1.80 | 103 | 2.05 | 96 | 2.26 | 90 | 2.46 | 85 | 2.65 | 81 | 2.85 |
| | -20 | ........ | ........ | ... | ... | ... | ... | 132 | 1.17 | 122 | 1.46 | 114 | 1.72 | 107 | 1.95 | 100 | 2.15 | 94 | 2.34 | 90 | 2.54 | 86 | 2.72 |
| | -10 | ........ | ........ | ... | ... | ... | ... | 135 | 1.13 | 126 | 1.40 | 118 | 1.64 | 111 | 1.86 | 105 | 2.06 | 99 | 2.24 | 95 | 2.42 | 91 | 2.59 |
| | 0 | ........ | ........ | ... | ... | ... | ... | 138 | 1.06 | 129 | 1.32 | 122 | 1.56 | 115 | 1.77 | 109 | 1.96 | 104 | 2.14 | 100 | 2.31 | 96 | 2.46 |
| 6 | -40 | ........ | ........ | ... | ... | ... | ... | 141 | 1.16 | 131 | 1.46 | 123 | 1.74 | 115 | 1.99 | 108 | 2.22 | 102 | 2.43 | 97 | 2.64 | 92 | 2.82 |
| | -30 | ........ | ........ | ... | ... | ... | ... | 143 | 1.11 | 134 | 1.40 | 126 | 1.67 | 118 | 1.90 | 111 | 2.11 | 106 | 2.32 | 101 | 2.52 | 96 | 2.69 |
| | -20 | ........ | ........ | ... | ... | ... | ... | 146 | 1.06 | 137 | 1.34 | 129 | 1.59 | 121 | 1.81 | 115 | 2.02 | 110 | 2.22 | 105 | 2.40 | 100 | 2.56 |
| | -10 | ........ | ........ | ... | ... | ... | ... | 149 | 1.02 | 140 | 1.28 | 132 | 1.52 | 125 | 1.73 | 119 | 1.93 | 114 | 2.12 | 109 | 2.29 | 104 | 2.44 |
| | 0 | ........ | ........ | ... | ... | ... | ... | 152 | .97 | 143 | 1.22 | 135 | 1.44 | 129 | 1.65 | 123 | 1.84 | 118 | 2.02 | 113 | 2.17 | 109 | 2.33 |
| 7 | -40 | ........ | ........ | ... | ... | ... | ... | 155 | 1.07 | 146 | 1.36 | 137 | 1.62 | 129 | 1.86 | 122 | 2.08 | 116 | 2.28 | 110 | 2.48 | 105 | 2.66 |
| | -30 | ........ | ........ | ... | ... | ... | ... | 157 | 1.03 | 148 | 1.31 | 139 | 1.55 | 131 | 1.77 | 125 | 1.99 | 119 | 2.18 | 113 | 2.36 | 109 | 2.55 |
| | -20 | ........ | ........ | ... | ... | ... | ... | 159 | .98 | 150 | 1.25 | 141 | 1.47 | 134 | 1.69 | 128 | 1.90 | 122 | 2.08 | 117 | 2.26 | 113 | 2.44 |
| | -10 | ........ | ........ | ... | ... | ... | ... | 161 | .94 | 152 | 1.19 | 144 | 1.41 | 137 | 1.62 | 131 | 1.81 | 126 | 1.99 | 121 | 2.16 | 117 | 2.33 |
| | 0 | ........ | ........ | ... | ... | ... | ... | 163 | .90 | 154 | 1.13 | 147 | 1.35 | 140 | 1.54 | 135 | 1.73 | 130 | 1.90 | 125 | 2.06 | 121 | 2.22 |
| 8 | -40 | ........ | ........ | ... | ... | ... | ... | 164 | .98 | 155 | 1.25 | 147 | 1.50 | 140 | 1.73 | 134 | 1.95 | 128 | 2.15 | 122 | 2.34 | 117 | 2.52 |
| | -30 | ........ | ........ | ... | ... | ... | ... | 166 | .94 | 157 | 1.20 | 149 | 1.44 | 142 | 1.65 | 136 | 1.86 | 130 | 2.05 | 125 | 2.24 | 120 | 2.40 |
| | -20 | ........ | ........ | ... | ... | ... | ... | 168 | .90 | 159 | 1.15 | 151 | 1.37 | 144 | 1.58 | 138 | 1.77 | 133 | 1.96 | 128 | 2.14 | 123 | 2.29 |
| | -10 | ........ | ........ | ... | ... | ... | ... | 170 | .87 | 161 | 1.10 | 153 | 1.31 | 147 | 1.51 | 141 | 1.69 | 136 | 1.87 | 131 | 2.04 | 126 | 2.18 |
| | 0 | ........ | ........ | ... | ... | ... | ... | 172 | .83 | 164 | 1.05 | 156 | 1.25 | 150 | 1.44 | 144 | 1.62 | 139 | 1.78 | 134 | 1.93 | 129 | 2.07 |

# Typical Industrial Applications

## Waste Heat

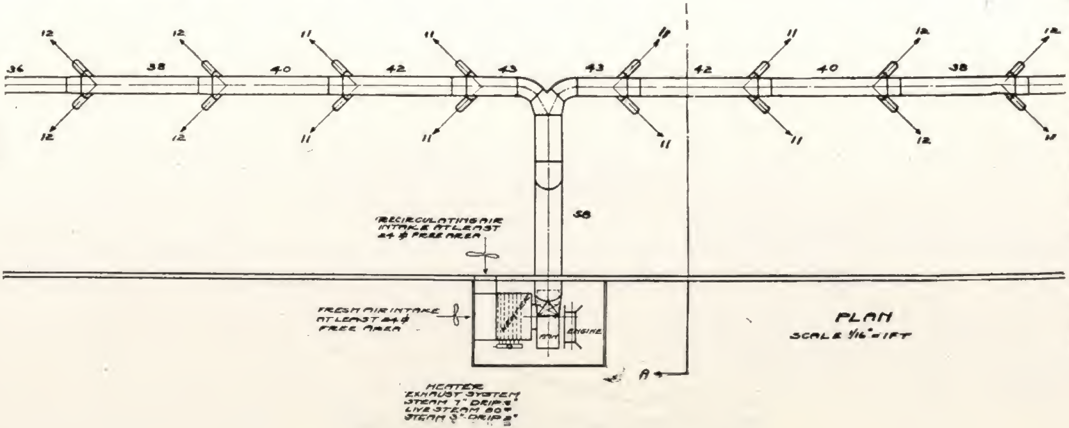
The system illustrated was installed in a carbon plant where they had retorts which were throwing off waste heat. The heat from these retorts being free from gases, dirt and dust, it was possible to gather it by means of hoods and draw it into the fan, which was located in another building. The fan distributed this heat to a three-story building adjoining. The actual cost of operating for the three-story building during the winter months was the cost of current consumed in the motor driving the fan. There are undoubtedly a number of industrial plants throughout the country where waste heat can be employed for heating. The installation of an air washer would remove dirt and dust and heated air used for heating another portion of the building.



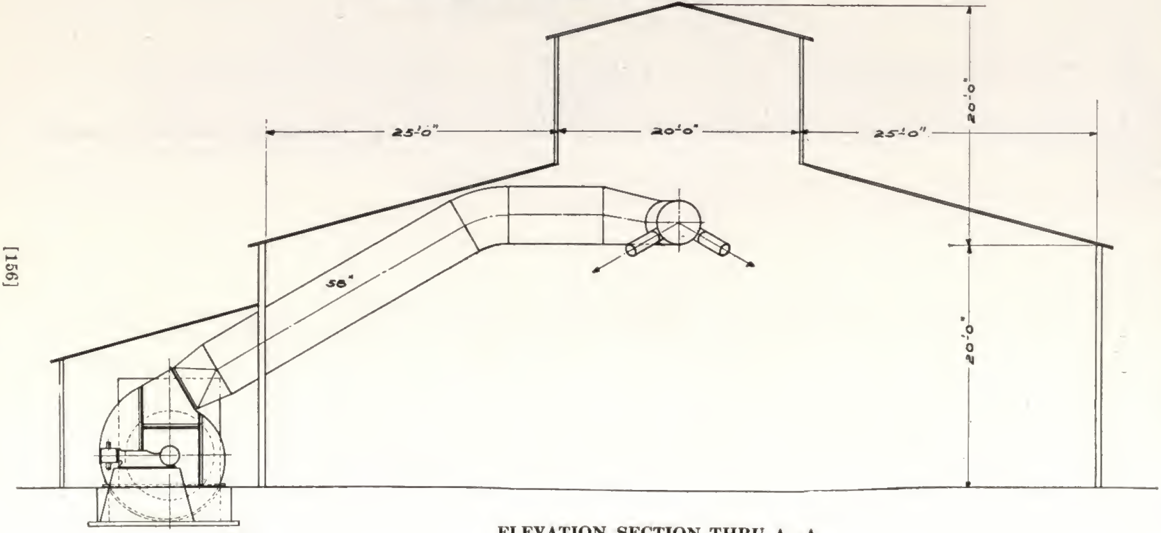
# Typical Industrial Applications

## Heating and Ventilating of a Bridge Plant

The heating and ventilating system in a large bridge plant, where the walls are practically all glass with an additional lantern the length of the building which has principally glass exposure, is here illustrated. Buildings of this type are more readily adapted to the fan system of heating than to direct radiation. By recirculating the air thru the the heaters to the fan the steam consumption is small. In buildings of this description where there is a great amount of leakage, a small percentage of fresh air is taken from the outside. This insures ideal healthy atmosphere in the building which cannot be obtained by direct radiation. This system is so arranged that either all or part of the air can be taken from either the outside or the air can be recirculated from the building. In buildings of this kind it is not necessary to maintain a uniform temperature only during working hours as the temperature in the building can be easily raised to the working temperature in a very short time by recirculating the air.



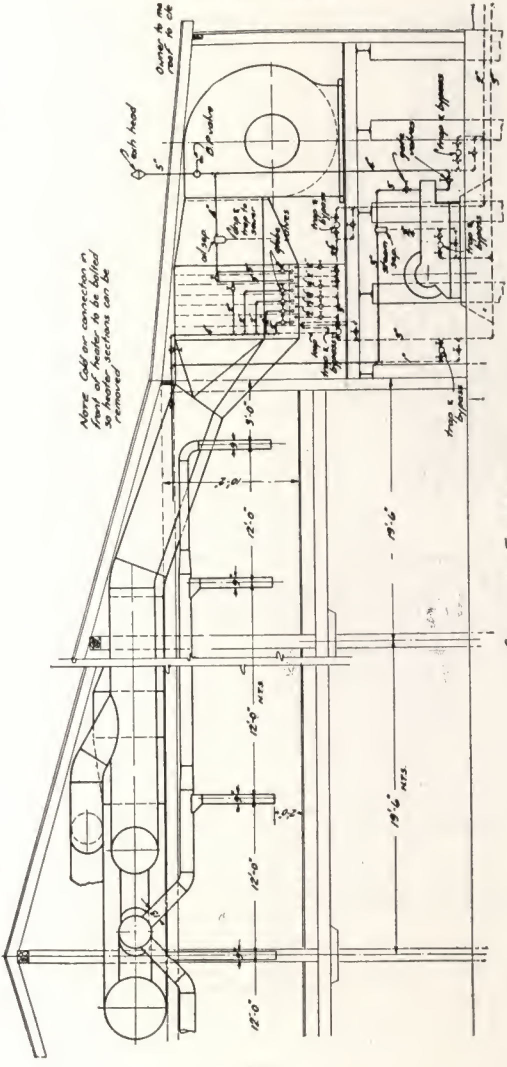
# Typical Industrial Applications
## Heating and Ventilating of a Bridge Plant



ELEVATION SECTION THRU A—A
Scale ⅛-in.=1 ft.

# Typical Industrial Applications

## Leather Drying

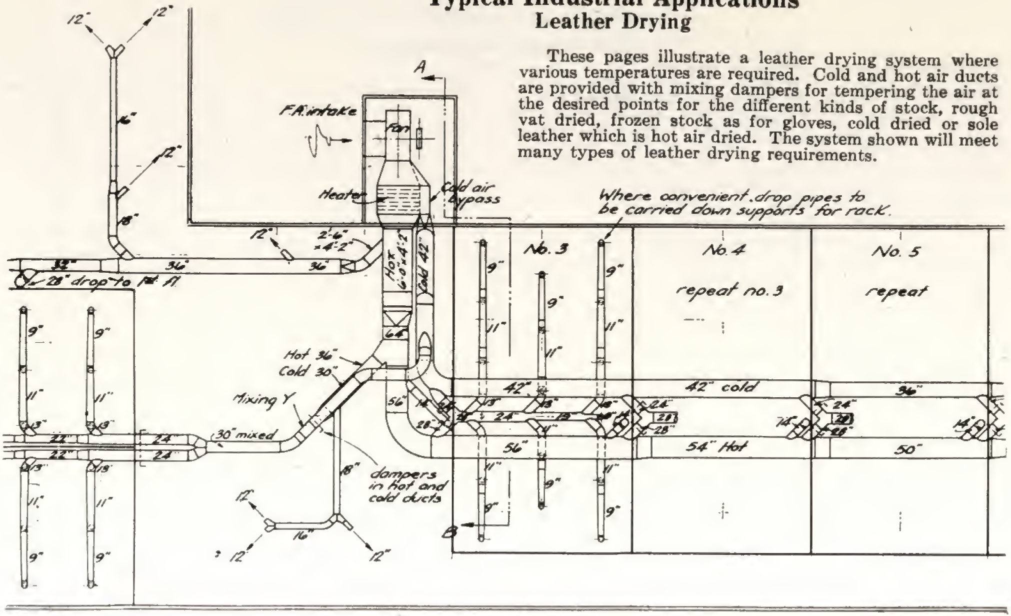

Note: Cold air connection in front of heater to be bolted so heater sections can be removed
Exh head
5"
Oil sep
Trap & bypass
Steam sep
5'-0"
10'-2"
12'-0"
19'-6"
12'-0" HTS
19'-6" HTS

SECTIONAL ELEVATION

# Typical Industrial Applications

## Leather Drying

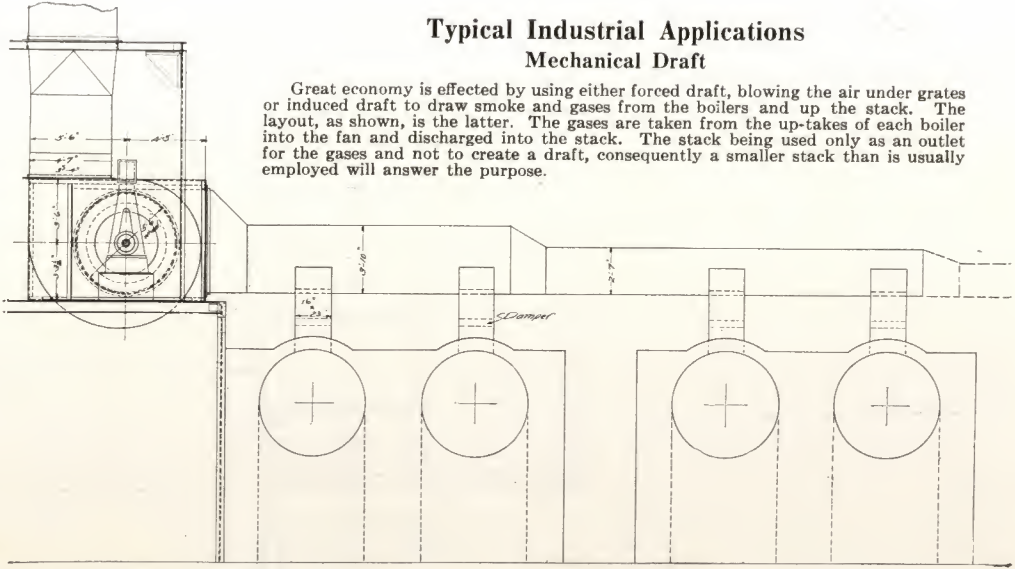
These pages illustrate a leather drying system where various temperatures are required. Cold and hot air ducts are provided with mixing dampers for tempering the air at the desired points for the different kinds of stock, rough vat dried, frozen stock as for gloves, cold dried or sole leather which is hot air dried. The system shown will meet many types of leather drying requirements.

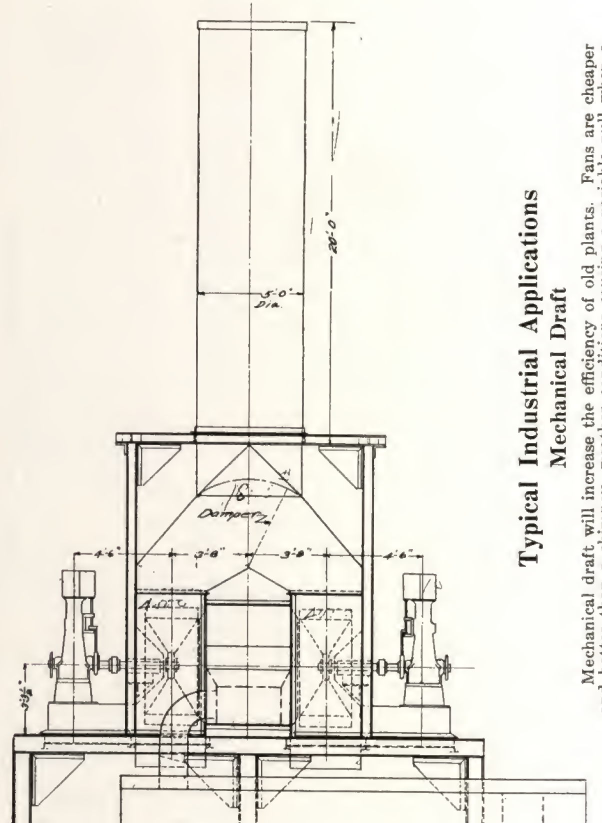


# Typical Industrial Applications

## Mechanical Draft

Great economy is effected by using either forced draft, blowing the air under grates or induced draft to draw smoke and gases from the boilers and up the stack. The layout, as shown, is the latter. The gases are taken from the up-takes of each boiler into the fan and discharged into the stack. The stack being used only as an outlet for the gases and not to create a draft, consequently a smaller stack than is usually employed will answer the purpose.





## Typical Industrial Applications

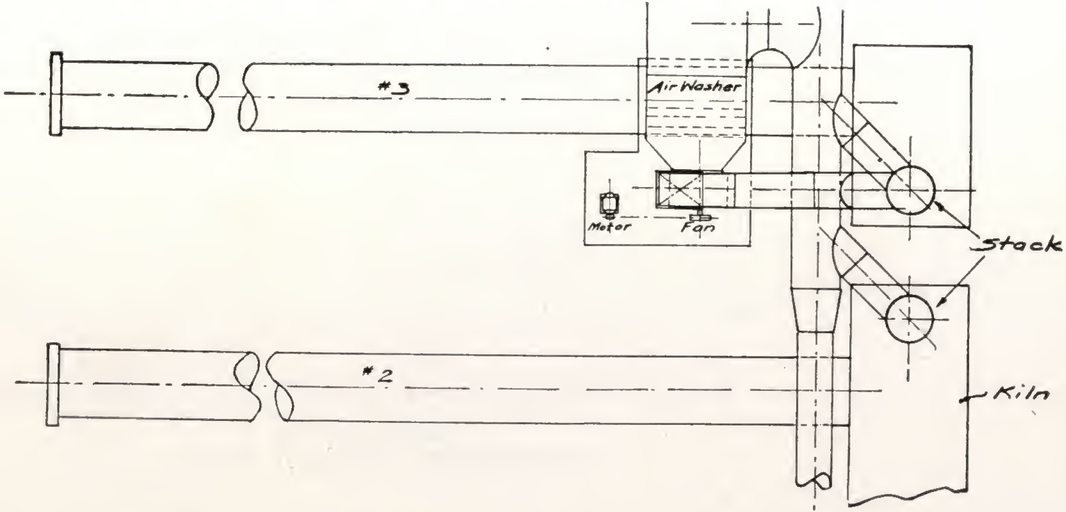
### Mechanical Draft

Mechanical draft will increase the efficiency of old plants. Fans are cheaper and better than a chimney, weather conditions causing a variable pull when a chimney is used for draft.

# Typical Industrial Applications

## Dust Collecting System

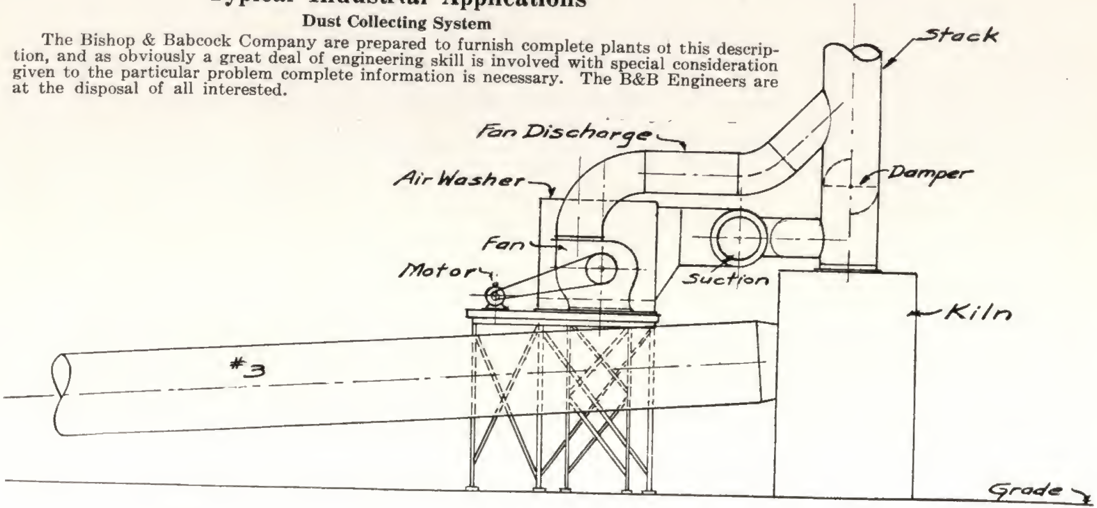
The system illustrated removes dust from chimney gases and which, in this instance, were a public nuisance. A B&B Massachusetts Air Washer and Fan removed the objection. A damper was placed in the stack, and the air washer as illustrated, 95% of the dust being removed.



# Typical Industrial Applications

## Dust Collecting System

The Bishop & Babcock Company are prepared to furnish complete plants of this description, and as obviously a great deal of engineering skill is involved with special consideration given to the particular problem complete information is necessary. The B&B Engineers are at the disposal of all interested.



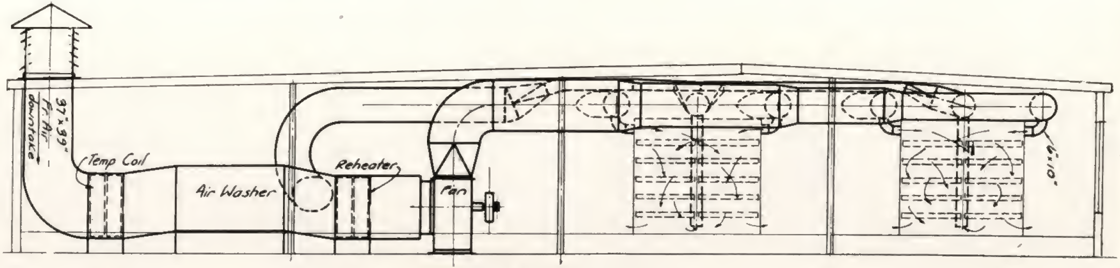
# Typical Industrial Applications

## Industrial Drying

The illustrations show a drying plant for gum, chicle, or other similar products, the material being dried being a crushed material placed on trays. Air is circulated downward through the trays at the proper temperature, resulting in even drying of the material. No crusting of products, or undue shriveling of the same occurs.

Temperatures ranging from 70 to 200 degrees are obtainable.

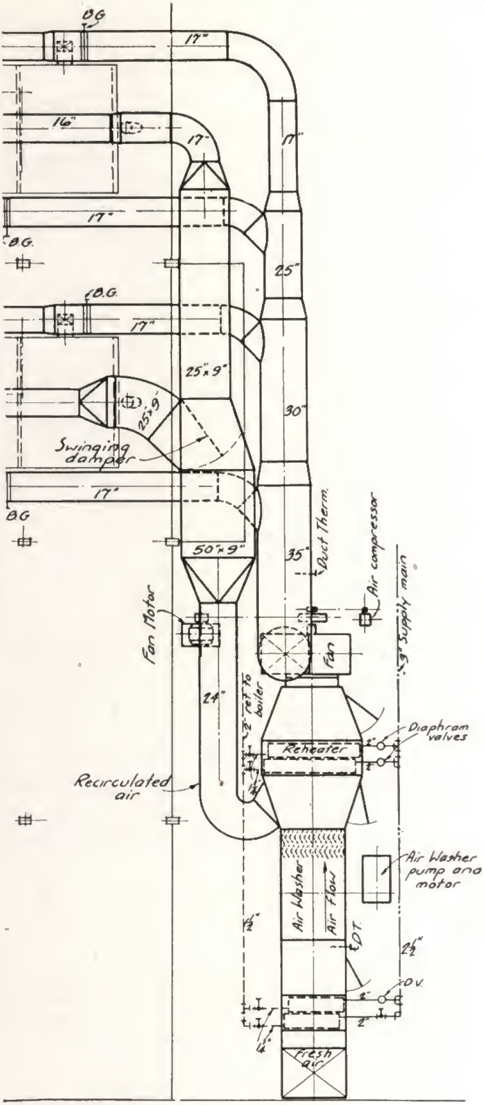
The B&B Engineers are prepared to design, build and erect drying apparatus for all industrial purposes, of the continuous type where wet materials enter one end and dry emerge at the other, or of the room type where material is commonly dried in trays as illustrated.



Elevation.

## Typical Industrial Applications

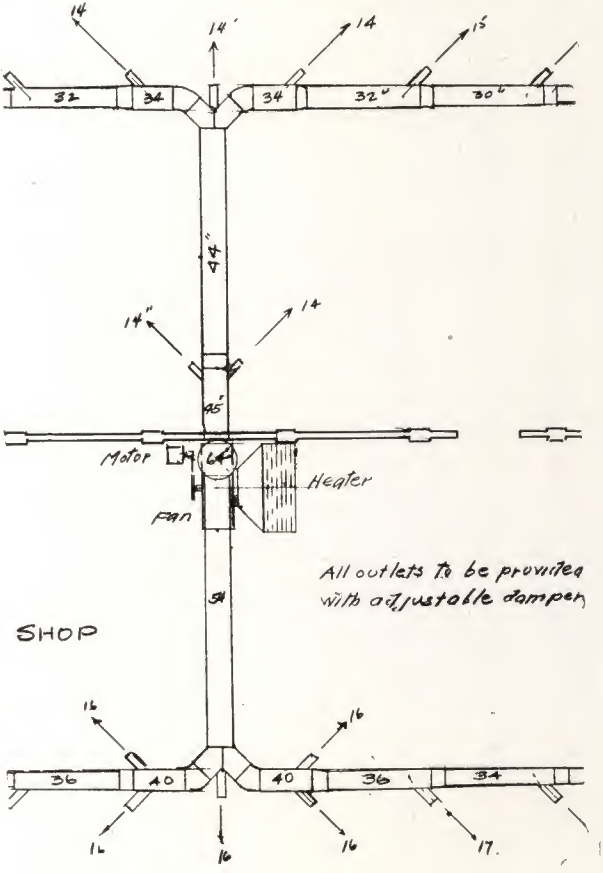
### Industrial Drying



# Typical Industrial Installations

## Shop Heating Plant

The heating of a railroad shop is illustrated on this page. Air is recirculated, the duct system run into the roof construction to be out of the way of craneways. The heated air is carried to the outside walls so that exposed surfaces are taken care of efficiently. In large buildings, where doors are opened frequently, it is not necessary to take in air from the outside for ventilation and recirculation is an economical and effective method of heating and ventilating.

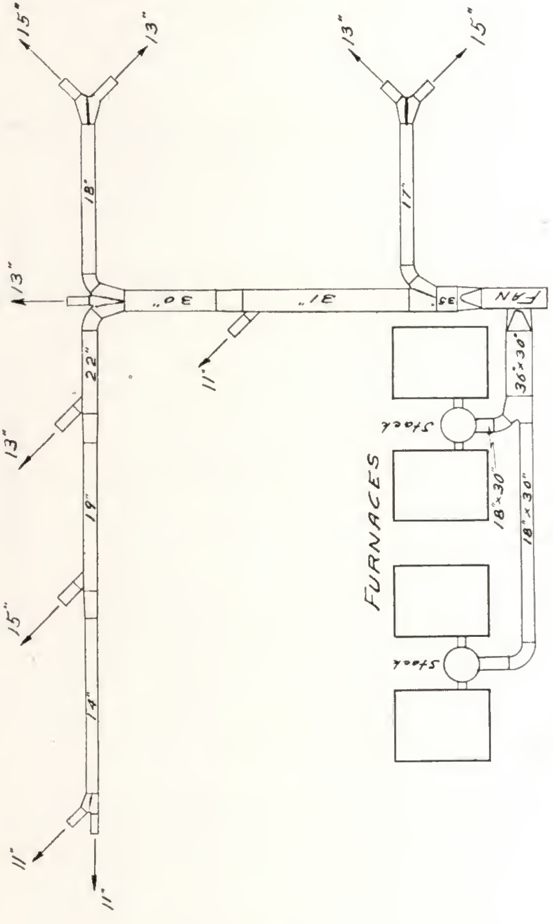


All outlets to be provided with adjustable damper

# Typical Industrial Installations

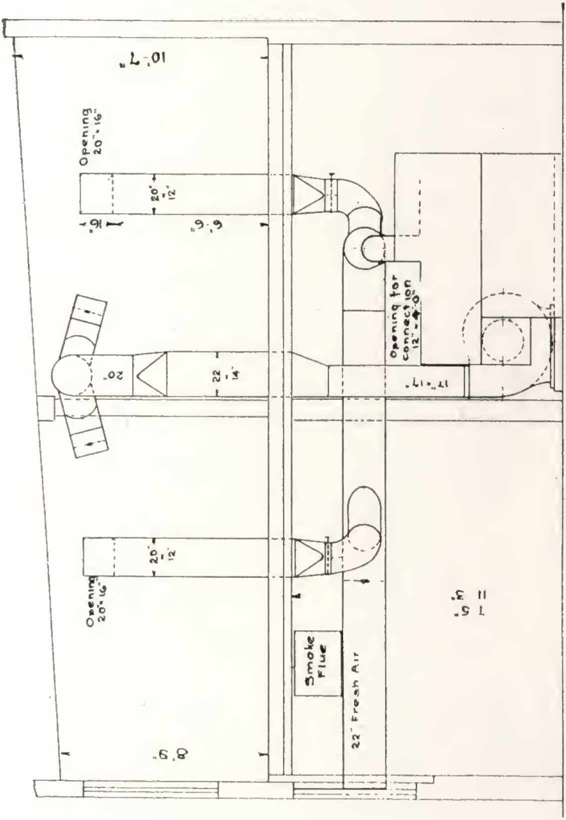
## Shop Heating Plant

The illustration on this page shows the heating arrangement as installed in a stamping and enameling shop.



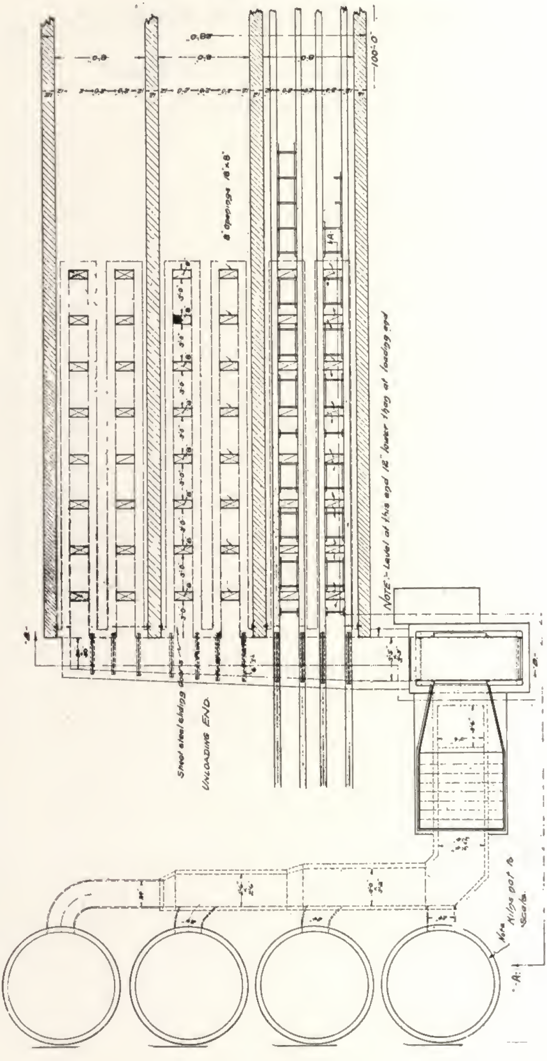
# Typical Industrial Installations

## Drying Arrangement for Tobacco and Similar Materials



# Typical Industrial Applications

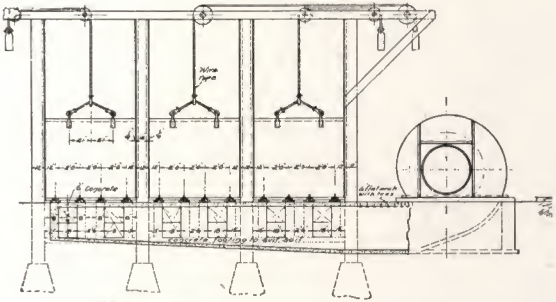
## Brick Drying



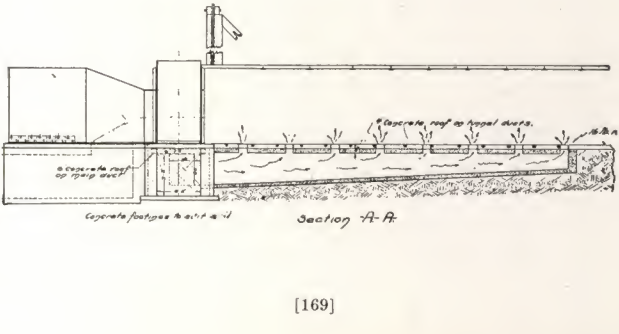
# Typical Industrial Installations

## Brick Drying

These pages illustrate a method of brick drying arranged for the utilization of waste heat from the kilns. An underground duct is used as illustrated and an auxiliary heating surface is provided for use when there is a lack of waste heat. Dampers permit of the throwing in of this auxiliary heating apparatus, and a desired temperature for drying green brick is under control. The fan forces hot air into a series of ducts terminating in the distributing system, the moist air leaving the kilns through a grating. Positive circulation of air is required for efficient performance. The B&B apparatus of this type have met with marked success and similar apparatus finds use in the drying of many types of ceramic ware.



Section B-B

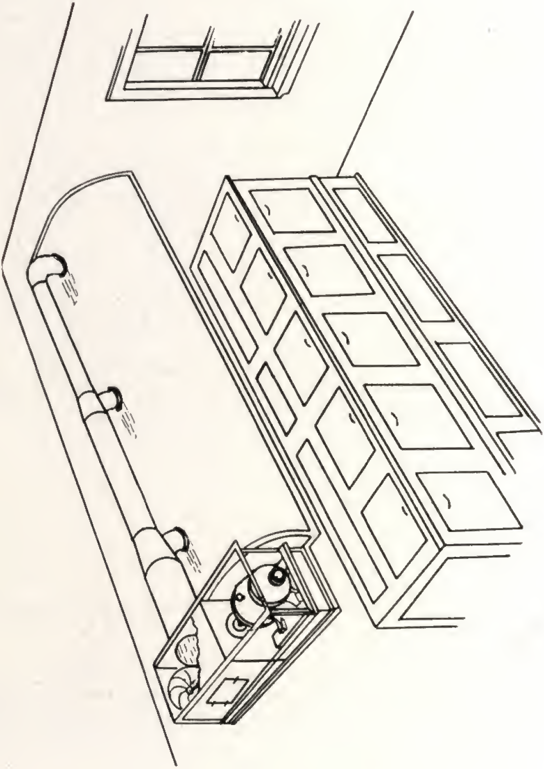

6" Concrete roof on lateral ducts.
6" Concrete roof on main duct
Concrete footings to suit soil

Section A-A

# Typical Industrial Applications

## Removal of Fumes, Odors, Etc., Over Stoves or Laboratory Apparatus

### Davidson Fan Installation



# The B&B Line of Massachusetts Air Washers

## Cleaning

The cleaning and purifying of the air is secured through the contact, in the spray chamber, of dirt, dust, soot, and bacteria with the fine water spray or mist. The impure particles, clinging to the minute globules of water are carried in air suspension through the spray chamber and impinged against a wetted scrubbing or flooding surface, consisting of vertical galvanized steel plates on one inch centers, having three separate breaks on 30° angle deflections, arranged to provide change in direction of air flow. These scrubbing or flooding plates are covered with a film of water by means of specially designed flooding nozzles, located at the extreme top limit of the washer.

Any particles of water that are carried through the scrubbing surface impinge against banks of dry eliminators having four breaks to provide 30° angle deflections in the air current. These changes in direction, together with the action of hook arrestors, which are a part of all Massachusetts Eliminators, remove all entrained and free particles of moisture from the air and with them the last vestige of dirt.

## Cooling

Cooling of air is accomplished by two methods:

1—Evaporation.

2—Cooling of the recirculated water by mechanical means or by supplying cold water from outside source for circulation through the nozzles.

## Cooling by Evaporation

Cooling by Evaporation—The entering air striking the bank of mist, created by the nozzles, starts a process of evaporation, requiring heat, which is taken from the air and water, consequently the air and water are both reduced in temperature. The water, being recirculated, will soon approach the wet bulb temperature of the entering air, and the air passing through the spray chamber and scrubbing section will be cooled to within a few dgrees of the water temperature. This cooling effect is generally expressed in percentage of initial wet bulb depression; the wet bulb depression being the difference between the dry bulb and wet bulb temperature in degrees Fahrenheit or Centigrade.

| | | |
|---|---|---|
| Example:— | Outside dry bulb temperature | 90° F |
| | Outside wet bulb temperature | 77° F |
| | Temperature of water in tank | 77° F |

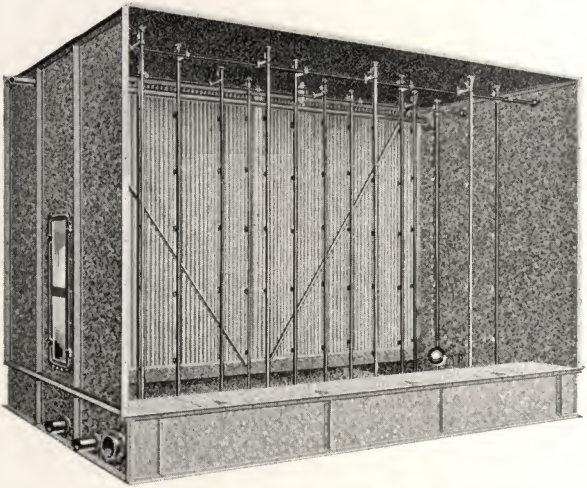
## The B&B Line of Massachusetts Air Washers

The ability of Massachusetts Washers to cool in percent of initial wet bulb depression depends upon the type of washer chosen. The Type A Air Washer will cool 85% of this depression. Types B and C will cool 95 to 100% of this depression. Therefore, considering in this example the Type A Washer, the decrease will be 85% of 13° or 11.15° F. The resultant air temperature will be 90° minus 11.15° F or 78.85° F, the washer cooling to within 1.85° F of the temperature of the water.

This decrease in temperature is obtained at an increase in relative humidity. It can be seen that the above cooling effect depends entirely on the condition of the outside air. If the air is dry a greater cooling effect is secured than when the air is damp. At such times as the outside air is almost at the saturation point, little or no cooling effect can be secured by evaporation

### Cooling by Mechanical Means

Cooling by Mechanical Means supplements cooling by evaporation. A further cooling of the air is secured by contact with a cold bank of mist or spray, the water being recirculated over some cooling medium and supplied



Massachusetts Air Washer Type B

## The B&B Line of Massachusetts Air Washers

constantly to the nozzles at a low temperature. Air can be cooled to almost any degree above freezing desired, depending upon the amount of refrigeration supplied to the water or, in cases of a supply of deep well water, the temperature of the water supply available.

The amount of evaporating effect and the cooling effect depend on the following factors:

1—Relative humidity of entering air.
2—Amount of water sprayed for a given volume of air.
3—Temperature of recirculated water.
4—Fineness of Spray.
5—Length of time treated air is in contact with water, which is governed by the distance between spray banks and eliminators.
6—Velocity of air travel.

### Types and Capacities of Massachusetts Air Washers

The Bishop & Babcock line of Massachusetts Air Washers, Coolers and Conditioning Equipment offer, in the following Standard Types, equipment designed to cover all present general uses and each designed for a particular service.

### Massachusetts Type "A" Air Washer

This type is an efficient apparatus, designed for all general work in washing, purifying and humidifying as encountered in the average ventilating system and should be used when cooling is a secondary factor to cleansing.

The total length of the Type "A" Washer is seven feet. Intimate contact of air and water is extended over a distance of nearly five feet, insuring a thorough and effcient washing effect, and resulting in the exact humidifying action required.

### Washing Effect

The Massachusetts Type "A" Air Washer will remove 98% of all dust, dirt, soot and other free foreign matter from the air.

### Cooling Effect

The Massachusetts Type "A" Air Washer will cool the entering air 85% of the initial wet bulb depression. An additional cooling effect may be secured by the use of cold water from outside sources. Also by the use of ice placed in the tank, although the latter method is not recommended as an economical practice.

## The B&B Line of Massachusetts Air Washers

### Humidifying Effect

Proper control of Humidity can be secured with this washer during the colder weather by means of a Closed or an Ejector Type Heater, operated and regulated by Bishop & Babcock Automatic Humidity Control Apparatus hereinafter described.

### Massachusetts Type "B" Air Washer

This type is designed for where as much cooling effect is desired as is possible without the use of Mechanical Refrigeration, and with the aid of agencies such as cold city water, deep well water, etc. It is similar in design to the Type "A" Washer, a second bank of spray nozzles being used and an additional length of Spray Chamber.

The total length of the Type "B" Washer is nine feet. A maximum period of intimate contact of air and water is afforded over a distance of nearly seven feet, thus insuring a very thorough and efficient washing and cleansing effect, a maximum decrease in the temperature of air treated, and in the exact humidifying action required.

### Washing Effect

The Massachusetts Type "B" Air Washer will remove 98% of all dust, dirt, soot, and other free foreign matter from the air.

### Cooling Effect

The Massachusetts Type "B" Air Washer will cool entering air 95% of the initial wet bulb depression.

### Humidifying Effect

Proper control of Humidity can be secured with this washer during the colder weather by means of a Closed or an Ejector Type Heater, operated and regulated by Bishop & Babcock Automatic Humidity Control Apparatus.

### Massachusetts Cooling Type Air Washer

This type of washer or Cooler is designed for use in cooling and cleansing air in conjunction with the use of Mechanical Refrigeration only.

The total length of a Standard Massachusetts Cooling Type Air Washer is 13′6″ and is equipped with a tank extending the entire length of washer. The washer is divided into three sections as follows:

## The B&B Line of Massachusetts Air Washers

1—Spray Chamber, five feet long, containing two banks of spray nozzles, the suction line to pump, suction strainer, ball float and other accessories.

2—A center section, five feet in length, fitted with a removable side and top cover, and a suitable number of Massachusetts Stuffing boxes for sealing the side cover at points where connections to Baudelot Coils and to rain sprays troughs over coils. The stuffing boxes and side covers are regularly furnished as standard equipment.

This center section is designed to contain the Baudelot Coils, troughs, and pipe connections to same. The five foot length is used on this section to establish a standard. The cooling section can be furnished in any desired length to meet the requirements of a particular installation.

3—A three foot six inch section, containing Scrubbing or Flooding Nozzles, Flooding Plates and two banks of Eliminators.

### Washing Effect

The Massachusetts Cooling Type Air Washer will remove 98% of all dust, dirt, soot or other free foreign matter from the air.

### Cooling Effect

The amount of Cooling effect obtained, being dependent on Mechanical Refrigeration, is governed by the size of the Refrigerating Unit used. Further information regarding complete cooling units will be furnished on request.

### Details of Construction Massachusetts Air Washers

We do not attempt, in this publication, to make any comparison of Massachusetts Air Washers with equipment of competitive make. We confine ourselves to a clear and concise listing of our standards and specifications which are in strict accordance with best modern practice for this class of equipment.

The following details of construction are common with all types of Massachusetts Washers. The various types being designed, each for a particular application rather than for the competitive nature of the applications.

# The B&B Line of Massachusetts Air Washers

## Tank

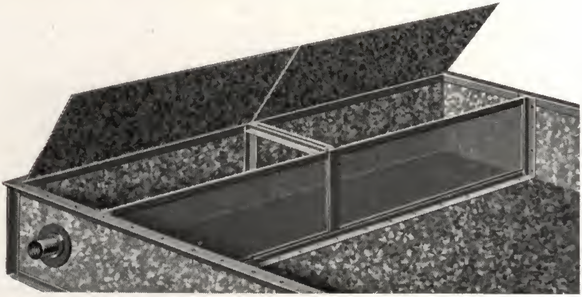
The tank is constructed of No. 13 or No. 11 steel sheets, depending on size, and is firmly braced with a rigid frame of angle iron. The welded construction of the tank eliminates all seams and rivets. The careful and rigid construction of this tank makes it a watertight container for the several thousand pounds of water it is required to hold and an efficient, firm support for the casing and other parts of the washer.

This type of tank construction will meet the most exacting requirements and due to the absence of all seams and rivets reduces corrosion to a minimum.

Tanks of unusually large size will be furnished with seams to be welded in the field.

## Suction Strainer

The strainer is located in the end of settling tank, dividing the tank into two compartments as all recirculated water to pump must pass through this strainer. An effective means of filtering this water is afforded, eliminating any possibility of clogging in the nozzles.



Suction Strainer

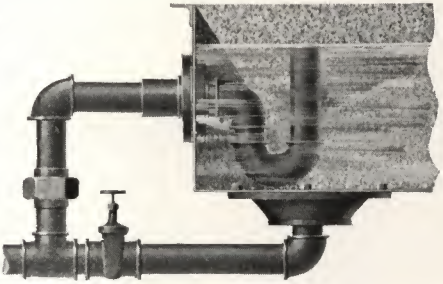
The strainer is made of No. 14 Mesh Brass Gauze, fitted in a rigid frame. The strainer is equipped with handles for easy removal and cleaning.

The strainer box is fitted with a No. 14 Gauge hinged galvanized steel cover to allow ready access to strainer.

# The B&B Line of Massachusetts Air Washers

## Drain and Overflow

A two inch overflow and a two inch valved drain is supplied with all standard washers. The drain and overflow have no standard location and are generally placed in the bottom of the tank at a point most convenient to the sewer line.



Where a large amount of water is constantly wasted in cooling, a larger overflow and drain are furnished.

Screw flanges are placed on each side of metal of the tank, and drawn together on rubber gaskets.

The overflow is furnished with a Goose Neck Water Seal Trap, which completely eliminates any possibility of the fan sucking odors and sewer gases into the spray chamber.

## Fresh Water Supply

A valve actuated by a ball float is installed in the tank as standard equipment to automatically maintain the proper water level in tank. This valve is connected to fresh water supply.

A ¾″ fresh water connection is also furnished, fitted with valve and hose connection, to be used when cleaning the washer and when refilling tank after cleaning.

## Suction and Supply Connections

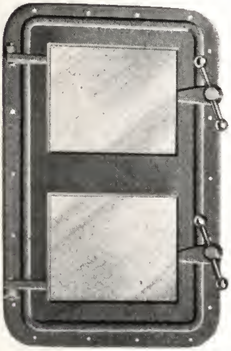
The connections made through the side of the tank for pump suction and discharge to supply headers vary in size to meet capacity of the washer. Supply connections are individually valved.

# The B&B Line of Massachusetts Air Washers

## Casing

The casing is made of No. 18 Galvanized Steel, thoroughly braced with galvanized angles, on centers not exceeding three feet. All seams and rivet heads are soldered to insure water tight construction. The top and sides are made separately and bolted together in the field, using Sherardized bolts and rubber gasket joints.

## Inspection Door



The casing is provided with a heavy galvanized cast iron inspection door, held tight with cam locks and rubber gaskets. This door permits free access to the Spray Chamber and a view of operation of the washer at all times through two heavy plate glass inserts in the door.

Washers less than four feet in height are furnished with a bull's eye window in place of an inspection door.

## Spray Headers

All spray headers are of extra heavy galvanized iron pipe, rigidly supported in tank to hold risers to mist nozzles in a fixed position. The vertical risers, in which the nozzles are placed, are tilted to prevent drip and condensation from breaking up the spray in lower spray chamber. These vertical risers are held rigidly in place by a cross support at top of the washer.

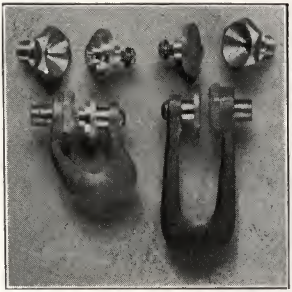
All spray headers are separately valved outside of the washer to allow a flexibility of washer control. During the season when excessive humidities are encountered and no cooling effect can be obtained, the spray banks may be shut off entirely and a suitable cleansing of air effected by the use of the Flooding Nozzles and plates alone, this without any appreciable increase in relative humidity.

# The B&B Line of Massachusetts Air Washers

### Spray Nozzles

The Spray heads or nozzles are of the non-cloggable, self-cleaning type, and eliminate the necessity of a flushing mechanism. The spray type of nozzle creates a finely divided mist with water at 15 pounds pressure, each nozzle having a capacity of two gallons of water per minute.

In the Type A Washer, one nozzle is provided for each square foot of sectional free area.



In the Type B & C Washers, two nozzles are provided for each square foot of sectional free area.

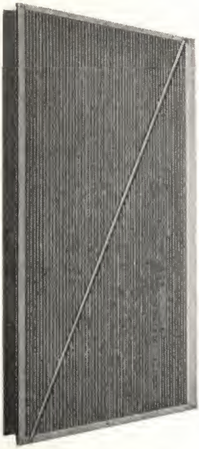
### Flooding Nozzles

The Flooding Nozzles, like the spray nozzles, are of the non-cloggable, self-cleaning type, and create a flat sheet of water, turning into a rain-like spray at the edges, insuring a uniform film of water covering the flooding or scrubbing surfaces at all times.

In cases where washers are of an extreme height, an additional row of flooding nozzles is placed half way down the plates to insure uniformity in the water film, and in cleansing effect.

### Marine Light

All Massachusetts Washers are provided with a waterproof marine lighting fixture which accommodates any standard electric light bulb. This makes a convenient and easy inspection of interior of the washer possible.



### Flooding or Scrubbing Surfaces

For the removal of dust, soot, and other foreign matter, which might pass the spray chamber, Flooding or Scrubbing surfaces are used, consisting of a row of vertical baffles, constructed of No. 20 to 22 gauge galvanized steel, according to size, spaced on one inch centers, arranged with three separate breaks on 30° angle deflections, and providing three changes in direction of air flow, resulting in an efficient cleansing process.

At 500 foot velocity 40 square feet of washing or scrubbing surface is furnished per 1000 CFM handled by the washer.

These Flooding Plates are assembled in sections, in rigid frames. One man can easily assemble the scrubber bank or any section can be readily removed for cleaning or repair.

### Eliminators

The Massachusetts Air Washer Eliminators remove the entrained water from the moistened or conditioned air, and consist of a series of vertical baffles, constructed of No. 20 to 22 Gauge galvanized steel, according to size, spaced 3″ on centers, and arranged with four breaks on 30° angle deflections, each break built with a hook arrester providing four changes in direction of airflow, their arrangement offering a minimum resistance to the passage of air and at the same time effectively removing all entrained water.

The resistance to the passage of air at an ordinary velocity of 500 feet per minute is under .17 inch water gauge.

The eliminators are constructed in sections or banks of convenient size for handling, and are shipped assembled, being held in position when installed in the washer by a rigid frame of galvanized angle iron. They are supported on a pedestal extending to the bottom of the air washer tank.

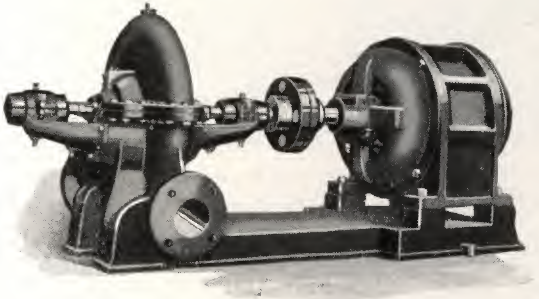
## The B&B Line of Massachusetts Air Washers

A complete bank of eliminators can be removed from the washer quickly and easily. A baffle plate is placed at the bottom of the front row of eliminators to prevent air by-passing under the eliminator bank.

At a velocity of 500 feet per minute, the washer presents an eliminating surface of 32 square feet per 1000 CFM handled by the washer.

### Pump and Motor

Double suction centrifugal type pumps with enclosed impellers are standard equipment for all sizes and types of Massachusetts Washers. The casing is split horizontally to allow easy inspection without disturbing water connections.



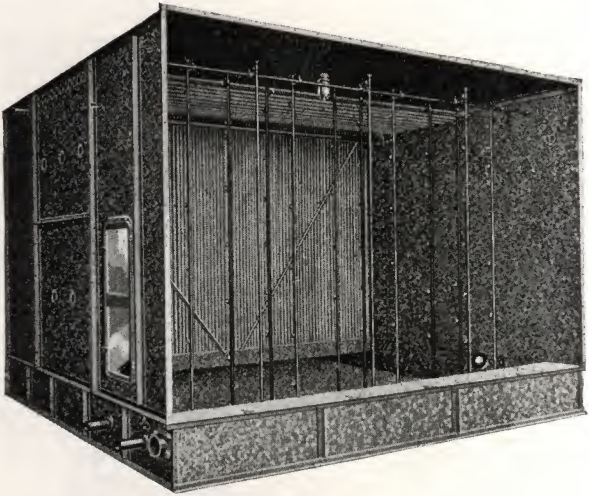
Pumps furnished with standard washers are driven by direct connected motors, motor and pump being mounted on a common cast iron base.

Pumps driven by a belt, steam turbine, or other means can be furnished when required.

### Pressure Gauge

A five inch diameter nickeled pressure gauge is furnished with all washers. This gauge is connected up to indicate the pressure at which the water is being supplied to the nozzles.

# The B&B Line of Massachusetts Air Washers



Massachusetts Cooling Type Air Washer

## Bishop and Babcock Automatic Humidity Control Apparatus

Control of humidity can be positively and accurately maintained by means of either of the two types of Bishop & Babcock automatic humidity control.

1—The open or ejector type in which the temperature of water is raised by steam passing directly into the spray water at the suction of circulating pump. This system should not be used unless a steam pressure of at least three pounds is at all times available.

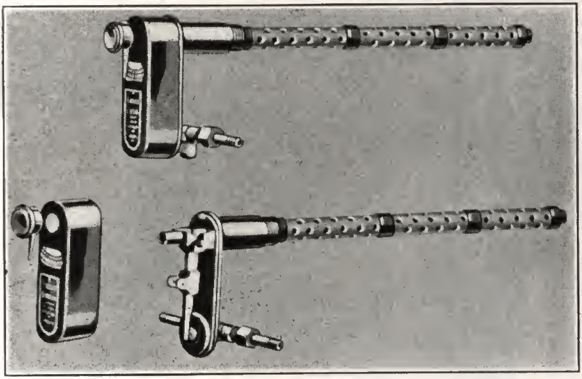
2—The Closed Heater Type in which a portion of the water is by-passed through a closed water heater of standard manufacture, the water being heated by a hot water or steam supply.

An Illustration showing the general arrangement of a Massachusetts Heating Ventilating and Air Conditioning System is given on Pages 186 and 187. This illustration also shows all temperature and humidity control equipment, together with pipe connection to same. On Page 188 will be found a complete description of this illustration and an explanation of the operation of the various apparatus.

# The B&B Line of Massachusetts Air Washers

## Bishop & Babcock Duct Hygrostat

The Bishop & Babcock Hygrostat is an insertion, or extended tube, pneumatic type instrument for controlling humidity. The operation depends on expansion or contraction of a number of sensitive wooden cylinders of cross grained maple, set in series, multiplying this effect.

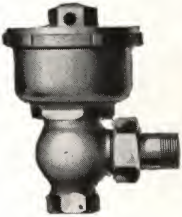


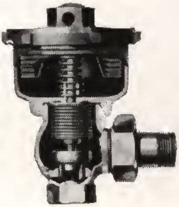
The expansion of this element, when the humidity rises, moves the lever arm which operates the main air valve.

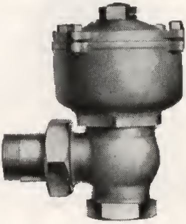
The valve in the Bishop & Babcock Hygrostat is the same type of valve which is used in Bishop & Babcock Thermostats, and contains no restricted openings, and is very easily connected up for the purpose for which it is used.

## Bishop & Babcock Multiflex Pneumatic Valves

The Bishop & Babcock Multiflex Pneumatic Valves are furnished in two types, viz: Normally Open, or Reversed







## The B&B Line of Massachusetts Air Washers

Valves which are normally closed. Their action is governed by the hygrostat or thermostat to which they may be connected, giving an automatic humidity control of highest quality and greatest serviceability.

The Bishop & Babcock Multiflex Pneumatic Valves are connected to the Hygrostat by ⅛″ air piping in which an operating pressure of 15 pounds is maintained by means of an air compressor. When the Hygrostat expands, due to humidity increase, the air is automatically allowed to flow to the Multiflex pneumatic valve, which, acting on the multiflex bellows therein, closes the valve tightly on its seat in the case of the normally open type, opening the Reversed or Normally Closed type; conversely, when the Hygrostatic element contracts, the air valve in the Hygrostat closes, exhausting the air, relieving the air pressure on the Multiflex pneumatic valve and causing the valve to revert to its normal position.

Closed Type Heater

### Closed Type Heater

Standard single pass vertical or horizontal heaters are used. Shell, tube heads, covers, supports and baffles are constructed of close grain grey iron. Tubes are of seamless drawn copper, corrugated ¾″ O D. The heater is so constructed that heating surface is entirely accessible. The heater is given hydraulic tests of 50 pounds on steam spaces, and 150 pounds on water spaces.

### Ejector or Open Type Heater

This is a combination noiseless heater and mixing chamber constructed of cast iron for intimately mixing the steam and water in the pump suction connection.

When this type of heater is used a Bishop & Babcock Dirt Strainer is furnished to be installed in pipe connection from pump discharge. This strainer is for the purpose of catching any scale or dirt, which may be brought in from the steam lines.

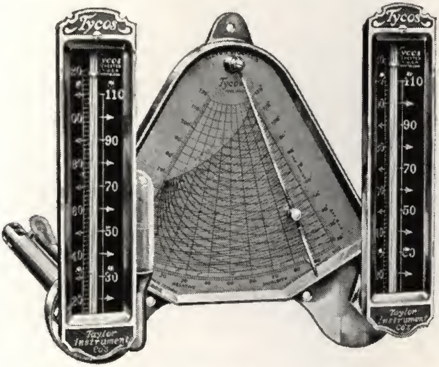
## The B&B Line of Massachusetts Air Washers

### Air Compressor and Tank

In cases where a supply of compressed air, from house supply or temperature control system, is not available, a motor or belt driven air cooled air compressor is furnished, together with tank, air regulating valve; with motor driven compressor, electric switch and pressure controlling device.

### Angle Hygrodeiks

The Hygrodeik consists of an angle wet bulb and dry bulb thermometer, together with a chart from which the humidity conditions can be determined without reference to tables. The instrument is of the insertion type and for measuring humidity in air ducts. There is a water reservoir of ample capacity extending parallel to stem of one angle thermometer, together with a water level indicator.

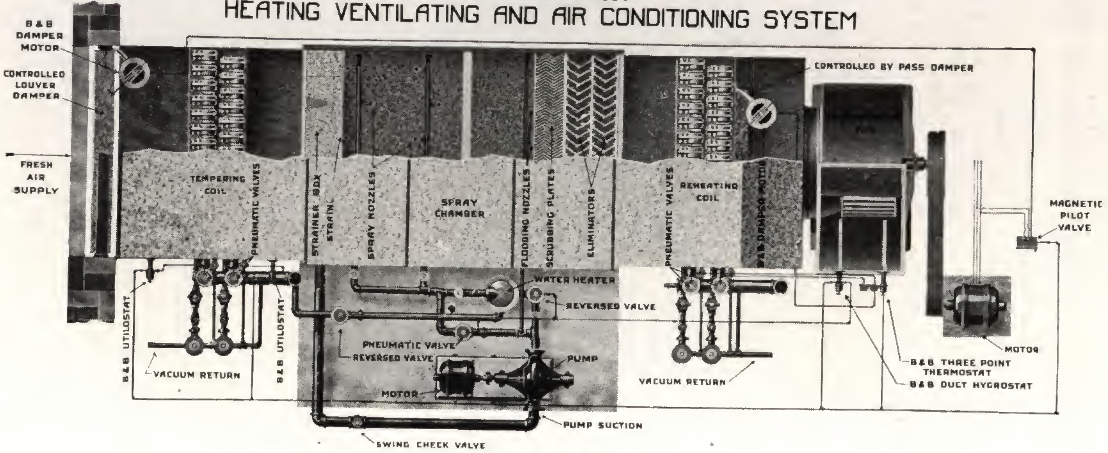


No. 1313

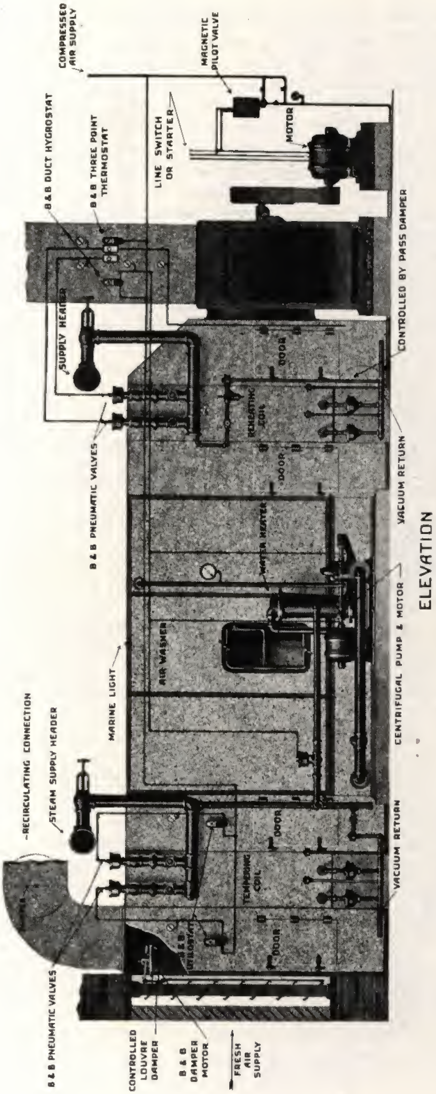
### Explanation of Operation of Massachusetts Heating, Ventilating and Air Conditioning System

On page 187 is shown an illustration of a typical Massachusetts Heating, Ventilating and Air Conditioning System, comprising a Fan and Motor, Reheating Coil, Massachusetts Air Washer, Tempering Coil, together with a complete Bishop & Babcock system of Automatic Temperature and Humidity Control. Steam Supply, Vacuum Return connections and fittings are also shown.

# TYPICAL ARRANGEMENT MASSACHUSETTS HEATING VENTILATING AND AIR CONDITIONING SYSTEM



SECTIONAL PLAN


COMPRESSED AIR SUPPLY
MAGNETIC PILOT VALVE
B & B DUCT HYGROSTAT
B & B THREE POINT THERMOSTAT
LINE SWITCH OR STARTER
MOTOR
SUPPLY HEADER
CONTROLLED BY PASS DAMPER
DOOR
REHEATING COIL
DOOR
B & B PNEUMATIC VALVES
VACUUM RETURN
WATER HEATER
AIR WASHER
CENTRIFUGAL PUMP & MOTOR
MARINE LIGHT
RECIRCULATING CONNECTION
STEAM SUPPLY HEADER
DOOR
TEMPERING COIL
VACUUM RETURN
B & B HYGROSTAT
DOOR
B & B PNEUMATIC VALVES
CONTROLLED LOUVRE DAMPER
B & B DAMPER MOTOR
FRESH AIR SUPPLY

ELEVATION

## The B&B Line of Massachusetts Air Washers

A brief description of the operation of system follows: Coincident with the starting of fan, a Magnetic Pilot Valve, wired in series between switch or starter and motor, opens a valve allowing air to flow from compressed air supply to Damper Motor at Fresh Air Intake, causing the pneumatic bellows in the Damper Motor to expand and open the controlled louvre damper, allowing fresh air to be admitted to the system. This damper is always arranged to be closed when system is not in operation, to prevent any possibility of freezing in the heaters or washer.

A Bishop & Babcock Utilostat or Duct Thermostat is placed in the casing between Fresh Air Intake and Tempering Coils. This Thermostat controls pneumatic valve on steam supply to first section of tempering coil and is set to open the valve when the outside temperature drops to 40° F. A second Utilostat is placed in the casing between the Tempering Coil and the Air Washer, and controls the pneumatic valve on steam supply to the second section of Tempering Coil. The setting of this second Utilostat is arbitrary, depending upon the class of work for which the system is used.

In the discharge duct from the fan is installed a Bishop & Babcock Three-point Thermostat. The first point controlling the by-pass damper under Re-heating Coils with a graduate action, the second and third points controlling the first and second sections of Reheating Coils respectively. The setting of this thermostat depends entirely upon the class of service for which the system is intended; for ventilating systems 68° and for heating and other purposes a correspondingly higher setting.

Accurate control of humidity is obtained by a Bishop & Babcock Duct Type Hygrostat installed in discharge duct from fan. This instrument is actuated by the expansion or contraction of a cross grained maple element, due to increase or decrease in the moisture content of the air. When the element contracts, the valve opens, allowing air to flow from the compressed air supply and operating two reversed and one normally open Pneumatic Valves.

The reversed or normally closed Pneumatic valves are installed in the steam supply to hot water heater and in the by-pass connection from pump through hot water heater. The normally open Pneumatic valve is installed in water connection from pump to spray header. The three valves operate in unison. When the relative humidity reaches the point at which the Hygrostat is set, the reversed valves in steam supply to hot water heater and heater by-pass start to close; the normally open valve in connection between the pump and spray header opens allowing all of the recirculated water to by-pass the hot water heater. Conversely, when the relative humidity drops below the point at which the Hygrostat is set, the reversed valves open and the normally open valve partially closes, by-passing the required portion of the recirculated water through the hot water heater, and the required humidifying effect is obtained.

### Applications of Massachusetts Air Washers

Owing to the unique and special nature of each air washing and conditioning problem, and the multitude of uses encountered, it is impossible for us to give, in this catalogue, more than general information as to the various uses to which the air washers are applied.

The following listing and brief discussions represent only a few of the many uses of Air Washing and Conditioning Equipment.

### Department Stores

The need of clean pure air in the Department Store is best expressed in the age old word "Shop-worn." The saving effected by reducing the losses, due to dust soiled goods, will pay for the air washing equipment many times over.

### Telephone Exchanges

Since the advent of the Automatic Telephone, air washing and cleansing equipment have become indispensable to the successful operation of the modern telephone exchange.

### Museum and Art Galleries

The maintaining of an atmosphere free from dust and dirt, and at a constant temperature and humidity, reduces to a minimum the decomposition and disintegration of the relics and priceless objects of art.

### Lithographing Plants

Change of register in lithographing is eliminated by maintaining a constant temperature and relative humidity in the press room. However, it is of importance that raw stock be supplied at a moisture content which is normal for the atmosphere which is maintained in the press room.

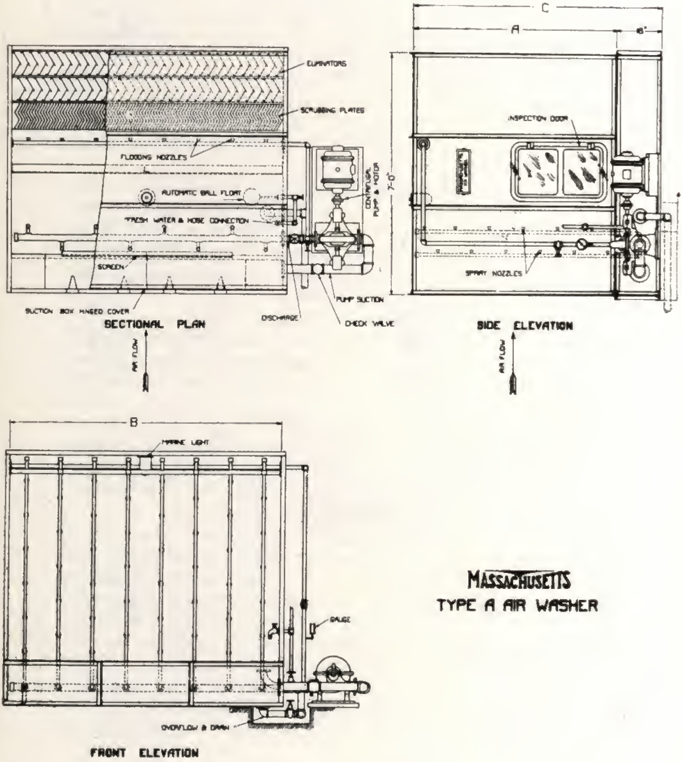
### Paper and Pulp Mills

Air conditioning systems, in the Finishing Rooms, insure a uniform moisture content in the finished product.

Clean air is essential in the manufacture of bleached pulp and white papers.

Additional applications are found in: Chemical Laboratories, Cooling Condenser Water, Solvent Recovery Systems, Cooling Engine Rooms, Pickling Rooms of Wire and Steel Plants, Drying Installations, Elimination of Dust in Manufacturing Processes, Sugar Refineries, Foundry Ventilation and Cooling.

# The B&B Line of Massachusetts Air Washers



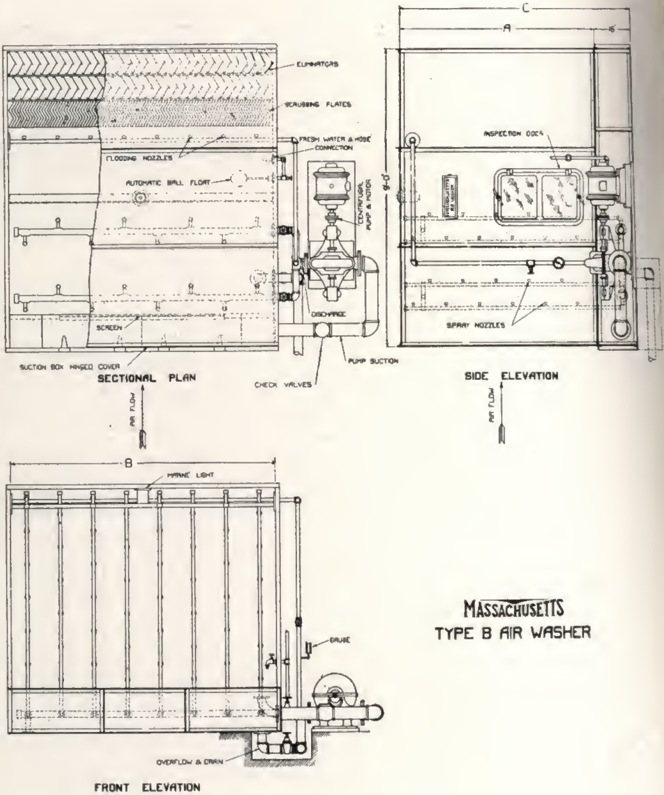
MASSACHUSETTS
TYPE A AIR WASHER

# The B&B Line of Massachusetts Air Washers

DATA AND DIMENSIONS
MASSACHUSETTS TYPE A AIR WASHER

| NO. OF WASHER | CAPACITY CUBIC FEET PER MIN |  | FREE AREA SQ. FT. | A | B | C | GALLONS PER MINUTE |  | NO NOZZLES |  | SIZE PUMP |  | H.P. MOTOR | WEIGHT IN LBS. |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  | 400' VEL | 500' VEL |  |  |  |  | SPRAY | FLOODING | SPRAY | FLOODING | SUCTION | DISCHARGE |  | WASHER | PUMP & MOTOR |
| A-22 | 1600 | 2000 | 4 | 2'-0" | 2'-0" | 3'-4" | 10 | 8 | 4 | 2 | 1½ | 1 | 1 | 890 | 425 |
| A-23 | 2400 | 3000 | 6 | - | 3'-0" | - | 15 | 12 | 6 | 3 | 1½ | 1 | 1½ | 1150 | 500 |
| A-24 | 3200 | 4000 | 8 | - | 4'-0" | - | 20 | 16 | 8 | 4 | 1½ | 1 | 1½ | 1325 | 500 |
| A-25 | 4000 | 5000 | 10 | - | 5'-0" | - | 25 | 20 | 10 | 5 | 2 | 1½ | 3 | 1510 | 525 |
| A-33 | 3600 | 4500 | 9 | 3'-0" | 3'-0" | 4'-4" | 23 | 12 | 9 | 3 | 1½ | 1 | 1½ | 1300 | 500 |
| A-34 | 4800 | 6000 | 12 | - | 4'-0" | - | 30 | 16 | 12 | 4 | 2 | 1½ | 3 | 1510 | 525 |
| A-35 | 6000 | 7500 | 15 | - | 5'-0" | - | 38 | 20 | 15 | 5 | 2 | 1½ | 3 | 1750 | 525 |
| A-36 | 7200 | 9000 | 18 | - | 6'-0" | - | 45 | 24 | 18 | 6 | 2 | 1½ | 3 | 1980 | 525 |
| A-37 | 8400 | 10500 | 21 | - | 7'-0" | - | 53 | 28 | 21 | 7 | 2 | 1½ | 3 | 2200 | 525 |
| A-43 | 4800 | 6000 | 12 | 4'-0" | 3'-0" | 5'-4" | 30 | 12 | 12 | 3 | 2 | 1½ | 2 | 1550 | 500 |
| A-44 | 6400 | 8000 | 16 | - | 4'-0" | - | 40 | 16 | 16 | 4 | 2 | 1½ | 3 | 1800 | 525 |
| A-45 | 8000 | 10000 | 20 | - | 5'-0" | - | 50 | 20 | 20 | 5 | 2 | 1½ | 3 | 2030 | 525 |
| A-46 | 9600 | 12000 | 24 | - | 6'-0" | - | 60 | 24 | 24 | 6 | 2 | 1½ | 3 | 2350 | 525 |
| A-47 | 11200 | 14000 | 28 | - | 7'-0" | - | 70 | 28 | 28 | 7 | 2½ | 2 | 3 | 2575 | 550 |
| A-48 | 12800 | 16000 | 32 | - | 8'-0" | - | 80 | 32 | 32 | 8 | 2½ | 2 | 3 | 2850 | 550 |
| A-53 | 6000 | 7500 | 15 | 5'-0" | 3'-0" | 6'-4" | 38 | 12 | 15 | 3 | 2 | 1½ | 3 | 1700 | 525 |
| A-54 | 8000 | 10000 | 20 | - | 4'-0" | - | 50 | 16 | 20 | 4 | 2 | 1½ | 3 | 1975 | 525 |
| A-55 | 10000 | 12500 | 25 | - | 5'-0" | - | 63 | 20 | 25 | 5 | 2 | 1½ | 3 | 2260 | 525 |
| A-56 | 12000 | 15000 | 30 | - | 6'-0" | - | 75 | 24 | 30 | 6 | 2½ | 2 | 3 | 2775 | 550 |
| A-57 | 14000 | 17500 | 35 | - | 7'-0" | - | 88 | 28 | 35 | 7 | 2½ | 2 | 3 | 3050 | 550 |
| A-58 | 16000 | 20000 | 40 | - | 8'-0" | - | 100 | 32 | 40 | 8 | 2½ | 2 | 5 | 3375 | 615 |
| A-59 | 18000 | 22500 | 45 | - | 9'-0" | - | 113 | 36 | 45 | 9 | 3 | 2½ | 5 | 3650 | 640 |
| A-64 | 9600 | 12000 | 24 | 6'-0" | 4'-0" | 7'-4" | 60 | 16 | 24 | 4 | 2 | 1½ | 3 | 2250 | 525 |
| A-65 | 12000 | 15000 | 30 | - | 5'-0" | - | 75 | 20 | 30 | 5 | 2½ | 2 | 3 | 2575 | 550 |
| A-66 | 14400 | 18000 | 36 | - | 6'-0" | - | 90 | 24 | 36 | 6 | 2½ | 2 | 3 | 3150 | 550 |
| A-67 | 16800 | 21000 | 42 | - | 7'-0" | - | 105 | 28 | 42 | 7 | 2½ | 2 | 5 | 3475 | 615 |
| A-68 | 19200 | 24000 | 48 | - | 8'-0" | - | 120 | 32 | 48 | 8 | 3 | 2½ | 5 | 3850 | 640 |
| A-69 | 21600 | 27000 | 54 | - | 9'-0" | - | 135 | 36 | 54 | 9 | 3 | 2½ | 5 | 4150 | 640 |
| A-610 | 24000 | 30000 | 60 | - | 10'-0" | - | 150 | 40 | 60 | 10 | 3 | 2½ | 5 | 4475 | 640 |
| A-611 | 26200 | 33000 | 66 | - | 11'-0" | - | 165 | 44 | 66 | 11 | 4 | 3 | 5 | 4800 | 675 |
| A-612 | 28800 | 36000 | 72 | - | 12'-0" | - | 180 | 48 | 72 | 12 | 4 | 3 | 5 | 5125 | 675 |
| A-75 | 14000 | 17500 | 35 | 7'-0" | 5'-0" | 8'-4" | 88 | 20 | 35 | 5 | 2½ | 2 | 3 | 2800 | 550 |
| A-76 | 16800 | 21000 | 42 | - | 6'-0" | - | 105 | 24 | 42 | 6 | 2½ | 2 | 5 | 3450 | 615 |
| A-77 | 19600 | 24500 | 49 | - | 7'-0" | - | 123 | 28 | 49 | 7 | 3 | 2½ | 5 | 4000 | 640 |
| A-78 | 22400 | 28000 | 56 | - | 8'-0" | - | 140 | 32 | 56 | 8 | 3 | 2½ | 5 | 4400 | 640 |
| A-79 | 25200 | 31500 | 63 | - | 9'-0" | - | 158 | 36 | 63 | 9 | 3 | 2½ | 5 | 4775 | 640 |
| A-710 | 28000 | 35000 | 70 | - | 10'-0" | - | 175 | 40 | 70 | 10 | 4 | 3 | 5 | 5175 | 675 |
| A-711 | 31300 | 38500 | 77 | - | 11'-0" | - | 193 | 44 | 77 | 11 | 4 | 3 | 5 | 5550 | 675 |
| A-712 | 33600 | 42000 | 84 | - | 12'-0" | - | 210 | 48 | 84 | 12 | 4 | 3 | 7½ | 6100 | 725 |
| A-86 | 19200 | 24000 | 48 | 8'-0" | 6'-0" | 9'-4" | 120 | 24 | 48 | 6 | 3 | 2½ | 5 | 3825 | 640 |
| A-87 | 22400 | 28000 | 56 | - | 7'-0" | - | 140 | 28 | 56 | 7 | 3 | 2½ | 5 | 4350 | 640 |
| A-88 | 25600 | 32000 | 64 | - | 8'-0" | - | 160 | 32 | 64 | 8 | 3 | 2½ | 5 | 4850 | 640 |
| A-89 | 28800 | 36000 | 72 | - | 9'-0" | - | 180 | 36 | 72 | 9 | 4 | 3 | 5 | 5250 | 675 |
| A-810 | 32000 | 40000 | 80 | - | 10'-0" | - | 200 | 40 | 80 | 10 | 4 | 3 | 5 | 5650 | 675 |
| A-811 | 35200 | 44000 | 88 | - | 11'-0" | - | 220 | 44 | 88 | 11 | 4 | 3 | 7½ | 6075 | 725 |
| A-812 | 38400 | 48000 | 96 | - | 12'-0" | - | 240 | 48 | 96 | 12 | 4 | 3 | 7½ | 6725 | 725 |
| A-813 | 41600 | 52000 | 104 | - | 13'-0" | - | 260 | 52 | 104 | 13 | 4 | 3 | 7½ | 7125 | 725 |
| A-814 | 44800 | 56000 | 112 | - | 14'-0" | - | 280 | 56 | 112 | 14 | 4 | 3 | 7½ | 7575 | 725 |
| A-97 | 25200 | 31500 | 63 | 9'-0" | 7'-0" | 10'-4" | 158 | 28 | 63 | 7 | 3 | 2½ | 5 | 4690 | 640 |
| A-98 | 28800 | 36000 | 72 | - | 8'-0" | - | 180 | 32 | 72 | 8 | 3 | 2½ | 5 | 5200 | 640 |
| A-99 | 32400 | 40500 | 81 | - | 9'-0" | - | 204 | 36 | 81 | 9 | 4 | 3 | 5 | 5675 | 575 |
| A-910 | 36000 | 45000 | 90 | - | 10'-0" | - | 225 | 40 | 90 | 10 | 4 | 3 | 7½ | 6100 | 725 |
| A-911 | 39600 | 49500 | 99 | - | 11'-0" | - | 247 | 44 | 99 | 11 | 4 | 3 | 7½ | 6550 | 725 |
| A-912 | 43200 | 54000 | 108 | - | 12'-0" | - | 270 | 48 | 108 | 12 | 4 | 3 | 7½ | 7250 | 725 |
| A-913 | 46800 | 58500 | 117 | - | 13'-0" | - | 293 | 52 | 117 | 13 | 4 | 3 | 7½ | 7800 | 725 |
| A-914 | 50400 | 63000 | 126 | - | 14'-0" | - | 315 | 56 | 126 | 14 | 5 | 4 | 7½ | 8250 | 925 |
| A-915 | 54000 | 67500 | 135 | - | 15'-0" | - | 338 | 60 | 135 | 15 | 5 | 4 | 10 | 8775 | 1000 |
| A-916 | 57600 | 72000 | 144 | - | 16'-0" | - | 360 | 64 | 144 | 16 | 5 | 4 | 10 | 9200 | 1000 |
| A-107 | 28000 | 35000 | 70 | 10'-0" | 7'-0" | 11'-4" | 175 | 28 | 70 | 7 | 3 | 2½ | 5 | 4825 | 640 |
| A-108 | 32000 | 40000 | 80 | - | 8'-0" | - | 200 | 32 | 80 | 8 | 4 | 3 | 5 | 5550 | 675 |
| A-109 | 36000 | 45000 | 90 | - | 9'-0" | - | 225 | 36 | 90 | 9 | 4 | 3 | 7½ | 6025 | 725 |
| A-1010 | 40000 | 50000 | 100 | - | 10'-0" | - | 250 | 40 | 100 | 10 | 4 | 3 | 7½ | 6500 | 725 |
| A-1011 | 44000 | 55000 | 110 | - | 11'-0" | - | 275 | 44 | 110 | 11 | 4 | 3 | 7½ | 6975 | 725 |
| A-1012 | 48000 | 60000 | 120 | - | 12'-0" | - | 300 | 48 | 120 | 12 | 5 | 4 | 7½ | 7780 | 925 |
| A-1013 | 52000 | 65000 | 130 | - | 13'-0" | - | 325 | 52 | 130 | 13 | 5 | 4 | 7½ | 8325 | 925 |
| A-1014 | 56000 | 70000 | 140 | - | 14'-0" | - | 350 | 56 | 140 | 14 | 5 | 4 | 10 | 8850 | 1000 |
| A-1015 | 60000 | 75000 | 150 | - | 15'-0" | - | 375 | 60 | 150 | 15 | 5 | 4 | 10 | 9350 | 1000 |
| A-1016 | 64000 | 80000 | 160 | - | 16'-0" | - | 400 | 64 | 160 | 16 | 5 | 4 | 10 | 9800 | 1000 |
| A-1017 | 68000 | 85000 | 170 | - | 17'-0" | - | 425 | 68 | 170 | 17 | 5 | 4 | 10 | 10550 | 1000 |
| A-1018 | 72000 | 90000 | 180 | - | 18'-0" | - | 450 | 72 | 180 | 18 | 5 | 4 | 15 | 11100 | 1200 |
| A-1019 | 76000 | 95000 | 190 | - | 19'-0" | - | 475 | 76 | 190 | 19 | 5 | 4 | 15 | 11600 | 1200 |
| A-1020 | 80000 | 100000 | 200 | - | 20'-0" | - | 500 | 80 | 200 | 20 | 5 | 4 | 15 | 12100 | 1200 |

# The B&B Line of Massachusetts Air Washers



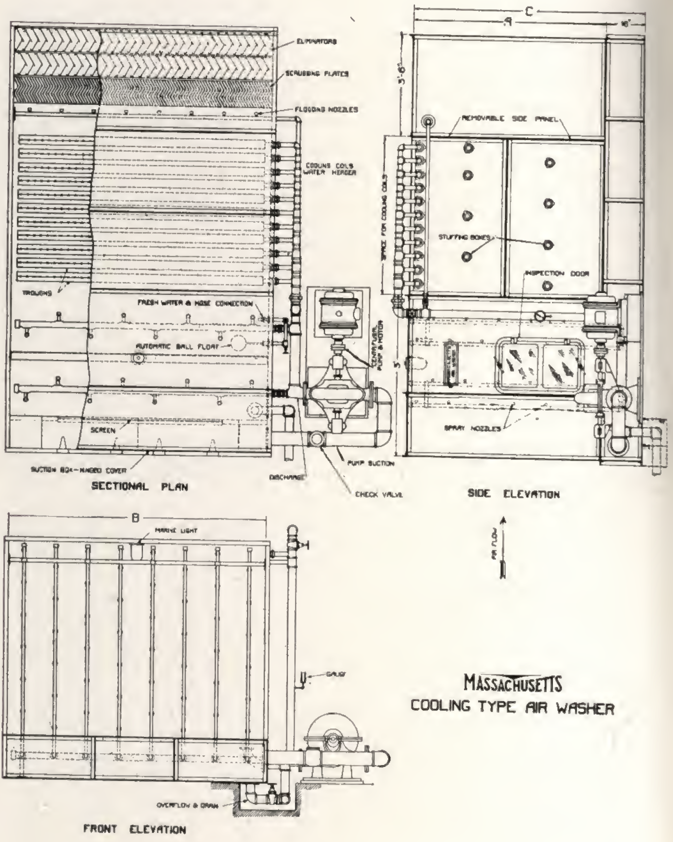
MASSACHUSETTS
TYPE B AIR WASHER

# The B&B Line of Massachusetts Air Washers

## DATA AND DIMENSIONS MASSACHUSETTS TYPE B AIR WASHER

| NO. OF WASHER | CAPACITY CUBIC FEET PER MIN | | FREE AREA SQ. FT. | A | B | C | GALLONS PER MINUTE | | NO. NOZZLES | | SIZE PUMP | | H.P MOTOR | WEIGHT IN LBS. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 400' VEL. | 500' VEL. | | | | | SPRAY | FLOODING | SPRAY | FLOODING | SUCTION | DISCHARGE | | WASHER | PUMP & MOTOR |
| B-22 | 1600 | 2000 | 4 | 2-0 | 2'-0" | 3-4 | 20 | 8 | 8 | 2 | 1½ | 1 | 1½ | 1025 | 500 |
| B-23 | 2400 | 3000 | 6 | - | 3'-0" | - | 30 | 12 | 12 | 3 | 2 | 1½ | 2 | 1275 | 500 |
| B-24 | 3200 | 4000 | 8 | - | 4'-0" | - | 40 | 16 | 16 | 4 | 2 | 1½ | 3 | 1500 | 525 |
| B-25 | 4000 | 5000 | 10 | - | 5'-0" | - | 50 | 20 | 20 | 5 | 2 | 1½ | 3 | 1725 | 525 |
| B-33 | 3600 | 4500 | 9 | 3'-0" | 3'-0" | 4-4" | 45 | 12 | 18 | 3 | 2 | 1½ | 3 | 1450 | 525 |
| B-34 | 4800 | 6000 | 12 | - | 4'-0" | - | 60 | 16 | 24 | 4 | 2 | 1½ | 3 | 1700 | 525 |
| B-35 | 6000 | 7500 | 15 | - | 5'-0" | - | 75 | 20 | 30 | 5 | 2½ | 2 | 3 | 1950 | 550 |
| B-36 | 7200 | 9000 | 18 | - | 6'-0" | - | 90 | 24 | 36 | 6 | 2½ | 2 | 3 | 2225 | 550 |
| B-37 | 8400 | 10500 | 21 | - | 7'-0" | - | 105 | 28 | 42 | 7 | 2½ | 2 | 5 | 2475 | 615 |
| B-43 | 4800 | 6000 | 12 | 4'-0" | 3'-0" | 5'-4" | 60 | 12 | 24 | 3 | 2 | 1½ | 3 | 1700 | 525 |
| B-44 | 6400 | 8000 | 16 | - | 4'-0" | - | 80 | 16 | 32 | 4 | 2½ | 2 | 3 | 2000 | 550 |
| B-45 | 8000 | 10000 | 20 | - | 5'-0" | - | 100 | 20 | 40 | 5 | 2½ | 2 | 3 | 2275 | 550 |
| B-46 | 9600 | 12000 | 24 | - | 6'-0" | - | 120 | 24 | 48 | 6 | 3 | 2½ | 5 | 2600 | 640 |
| B-47 | 11200 | 14000 | 28 | - | 7'-0" | - | 140 | 28 | 56 | 7 | 3 | 2½ | 5 | 2875 | 640 |
| B-48 | 12800 | 16000 | 32 | - | 8'-0" | - | 160 | 32 | 64 | 8 | 3 | 2½ | 5 | 3150 | 640 |
| B-53 | 6000 | 7500 | 15 | 5'-0" | 3'-0" | 6'-4" | 75 | 12 | 30 | 3 | 2 | 1½ | 3 | 1900 | 525 |
| B-54 | 8000 | 10000 | 20 | - | 4'-0" | - | 100 | 16 | 40 | 4 | 2½ | 2 | 3 | 2200 | 550 |
| B-55 | 10000 | 12500 | 25 | - | 5'-0" | - | 125 | 20 | 50 | 5 | 3 | 2½ | 5 | 2525 | 640 |
| B-56 | 12000 | 15000 | 30 | - | 6'-0" | - | 150 | 24 | 60 | 6 | 3 | 2½ | 5 | 3050 | 640 |
| B-57 | 14000 | 17500 | 35 | - | 7'-0" | - | 175 | 28 | 70 | 7 | 3 | 2½ | 5 | 3350 | 640 |
| B-58 | 16000 | 20000 | 40 | - | 8'-0" | - | 200 | 32 | 80 | 8 | 4 | 3 | 5 | 3750 | 675 |
| B-59 | 18000 | 22500 | 45 | - | 9'-0" | - | 225 | 36 | 90 | 9 | 4 | 3 | 7½ | 4050 | 725 |
| B-64 | 9600 | 12000 | 24 | 6'-0" | 4'-0" | 7'-4" | 120 | 16 | 48 | 4 | 2½ | 2 | 5 | 2500 | 615 |
| B-65 | 12000 | 15000 | 30 | - | 5'-0" | - | 150 | 20 | 60 | 5 | 3 | 2½ | 5 | 2875 | 640 |
| B-66 | 14400 | 18000 | 36 | - | 6'-0 | - | 180 | 24 | 72 | 6 | 3 | 2½ | 5 | 3475 | 640 |
| B-67 | 16800 | 21000 | 42 | - | 7'-0" | - | 210 | 28 | 84 | 7 | 4 | 3 | 5 | 3850 | 675 |
| B-68 | 19200 | 24000 | 48 | - | 8'-0" | - | 240 | 32 | 96 | 8 | 4 | 3 | 7½ | 4250 | 725 |
| B-69 | 21600 | 27000 | 54 | - | 9'-0 | - | 270 | 36 | 108 | 9 | 4 | 3 | 7½ | 4600 | 725 |
| B-610 | 24000 | 30000 | 60 | - | 10'-0" | - | 300 | 40 | 120 | 10 | 4 | 3 | 7½ | 4950 | 725 |
| B-611 | 26200 | 33000 | 66 | - | 11'-0" | - | 330 | 44 | 132 | 11 | 5 | 4 | 7½ | 5350 | 925 |
| B-612 | 28800 | 36000 | 72 | - | 12'-0" | - | 360 | 48 | 144 | 12 | 5 | 4 | 10 | 5700 | 1000 |
| B-75 | 14000 | 17500 | 35 | 7'-0" | 5'-0" | 8'-4" | 175 | 20 | 70 | 5 | 3 | 2½ | 5 | 3100 | 640 |
| B-76 | 16800 | 21000 | 42 | - | 6'-0" | - | 210 | 24 | 84 | 6 | 4 | 3 | 5 | 3800 | 675 |
| B-77 | 19600 | 24500 | 49 | - | 7'-0" | - | 245 | 28 | 98 | 7 | 4 | 3 | 7½ | 4400 | 725 |
| B-78 | 22400 | 28000 | 56 | - | 8'-0 | - | 280 | 32 | 112 | 8 | 4 | 3 | 7½ | 4850 | 725 |
| B-79 | 25200 | 31500 | 63 | - | 9'-0" | - | 315 | 36 | 126 | 9 | 4 | 3 | 7½ | 5250 | 725 |
| B-710 | 28000 | 35000 | 70 | - | 10'-0" | - | 350 | 40 | 140 | 10 | 5 | 4 | 7½ | 5725 | 925 |
| B-711 | 31800 | 38500 | 77 | - | 11'-0" | - | 385 | 44 | 154 | 11 | 5 | 4 | 10 | 6125 | 1000 |
| B-712 | 33600 | 42000 | 84 | - | 12'-0" | - | 420 | 48 | 168 | 12 | 5 | 4 | 10 | 8725 | 1000 |
| B-86 | 19200 | 24000 | 48 | 8'-0" | 6'-0" | 9'-4" | 240 | 24 | 96 | 6 | 4 | 3 | 7½ | 4200 | 725 |
| B-87 | 22400 | 28000 | 56 | - | 7'-0" | - | 280 | 28 | 112 | 7 | 4 | 3 | 7½ | 4800 | 725 |
| B-88 | 25600 | 32000 | 64 | - | 8'-0 | - | 320 | 32 | 128 | 8 | 4 | 3 | 7½ | 5300 | 725 |
| B-89 | 28800 | 36000 | 72 | - | 9'-0" | - | 360 | 36 | 144 | 9 | 5 | 4 | 7½ | 5800 | 925 |
| B-810 | 32000 | 40000 | 80 | - | 10'-0" | - | 400 | 40 | 160 | 10 | 5 | 4 | 10 | 6225 | 1000 |
| B-811 | 35200 | 44000 | 88 | - | 11'-0" | - | 440 | 44 | 176 | 11 | 5 | 4 | 10 | 6700 | 1000 |
| B-812 | 38400 | 48000 | 96 | - | 12'-0 | - | 480 | 48 | 192 | 12 | 5 | 4 | 15 | 7375 | 1200 |
| B-813 | 41600 | 52000 | 104 | - | 13'-0" | - | 520 | 52 | 208 | 13 | 5 | 4 | 15 | 7800 | 1200 |
| B-814 | 44800 | 56000 | 112 | - | 14'-0" | - | 560 | 56 | 224 | 14 | 5 | 4 | 15 | 8300 | 1200 |
| B-97 | 25200 | 31500 | 63 | 9'-0" | 7'-0" | 10'-4" | 315 | 28 | 126 | 7 | 4 | 3 | 7½ | 5150 | 725 |
| B-98 | 28800 | 36000 | 72 | - | 8'-0" | - | 360 | 32 | 144 | 8 | 5 | 4 | 7½ | 5725 | 925 |
| B-99 | 32400 | 40500 | 81 | - | 9'-0" | - | 405 | 36 | 162 | 9 | 5 | 4 | 10 | 6200 | 1000 |
| B-910 | 36000 | 45000 | 90 | - | 10'-0" | - | 450 | 40 | 180 | 10 | 5 | 4 | 10 | 6700 | 1000 |
| B-911 | 39600 | 49500 | 99 | - | 11'-0" | - | 495 | 44 | 198 | 11 | 5 | 4 | 15 | 7200 | 1200 |
| B-912 | 43200 | 54000 | 108 | - | 12'-0" | - | 540 | 48 | 216 | 12 | 5 | 4 | 15 | 8000 | 1200 |
| B-913 | 46800 | 58500 | 117 | - | 13'-0" | - | 585 | 52 | 234 | 13 | 5 | 4 | 15 | 8500 | 1200 |
| B-914 | 50400 | 63000 | 126 | - | 14'-0" | - | 630 | 56 | 252 | 14 | 5 | 4 | 15 | 9000 | 1200 |
| B-915 | 54000 | 67500 | 135 | - | 15'-0" | - | 675 | 60 | 270 | 15 | 6 | 5 | 15 | 9600 | 1500 |
| B-916 | 57600 | 72000 | 144 | - | 16'-0" | - | 720 | 64 | 288 | 16 | 6 | 5 | 15 | 10125 | 1500 |
| B-107 | 28000 | 35000 | 70 | 10'-0" | 7'-0 | 11'-4 | 350 | 28 | 140 | 7 | 5 | 4 | 7½ | 5325 | 925 |
| B-108 | 32000 | 40000 | 80 | - | 8'-0" | - | 400 | 32 | 160 | 8 | 5 | 4 | 10 | 6075 | 1000 |
| B-109 | 36000 | 45000 | 90 | - | 9'-0" | - | 450 | 36 | 180 | 9 | 5 | 4 | 10 | 6600 | 1000 |
| B-1010 | 40000 | 50000 | 100 | - | 10'-0" | - | 500 | 40 | 200 | 10 | 5 | 4 | 15 | 7125 | 1200 |
| B-1011 | 44000 | 55000 | 110 | - | 11'-0 | - | 550 | 44 | 220 | 11 | 5 | 4 | 15 | 7650 | 1200 |
| B-1012 | 48000 | 60000 | 120 | - | 12'-0" | - | 600 | 48 | 240 | 12 | 5 | 4 | 15 | 8500 | 1200 |
| B-1013 | 52000 | 65000 | 130 | - | 13'-0" | - | 650 | 52 | 260 | 13 | 6 | 5 | 15 | 9125 | 1500 |
| B-1014 | 56000 | 70000 | 140 | - | 14'-0 | - | 700 | 56 | 280 | 14 | 6 | 5 | 15 | 9700 | 1500 |
| B-1015 | 60000 | 75000 | 150 | - | 15'-0 | - | 750 | 60 | 300 | 15 | 6 | 5 | 20 | 10225 | 1650 |
| B-1016 | 64000 | 80000 | 160 | - | 16'-0" | - | 800 | 64 | 320 | 16 | 6 | 5 | 20 | 10750 | 1650 |
| B-1017 | 68000 | 85000 | 170 | - | 17'-0" | - | 850 | 68 | 340 | 17 | 6 | 5 | 20 | 11550 | 1650 |
| B-1018 | 72000 | 90000 | 180 | - | 18'-0" | - | 900 | 72 | 360 | 18 | 6 | 5 | 20 | 12150 | 1650 |
| B-1019 | 76000 | 95000 | 190 | - | 19'-0" | - | 950 | 76 | 380 | 19 | 6 | 5 | 20 | 12700 | 1650 |
| B-1020 | 80000 | 100000 | 200 | - | 20'-0" | - | 1000 | 80 | 400 | 20 | 8 | 6 | 25 | 13225 | 2100 |

# The B&B Line of Massachusetts Air Washers



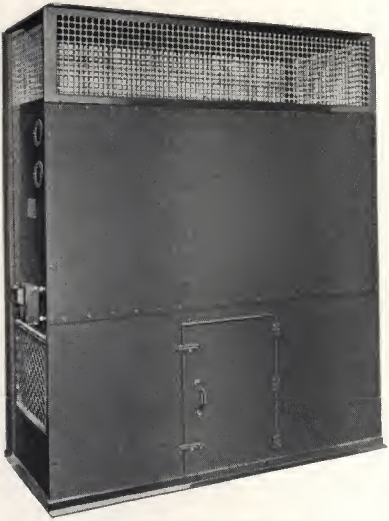
MASSACHUSETTS
COOLING TYPE AIR WASHER

# The B&B Line of Massachusetts Air Washers

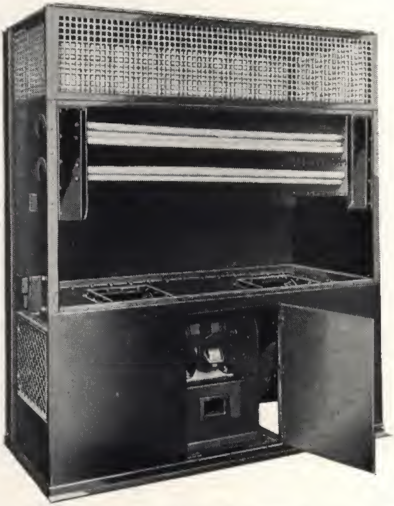
DATA AND DIMENSIONS
MASSACHUSETTS COOLING TYPE AIR WASHER

| NO. OF WASHER | CAPACITY CUBIC FEET PER MIN | | FREE AREA SQ. FT. | A | B | C | GALLONS PER. MINUTE | | | NO. NOZZLES | | SIZE PUMP | | H.P MOTOR | WEIGHT IN LBS. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 400' VEL | 500' VEL | | | | | SPRAY | FLOOD'G | COOLING | SPRAY | FLOOD'G | SUC. | DIS | | WASHER | PUMP & MOTOR | ADD. FOOT COOLING SPACE |
| C-22 | 1600 | 2000 | 4 | 2'-0" | 2'-0" | 3'-4" | 20 | 8 | 15 | 8 | 2 | 2 | 1½ | 2 | 1300 | 500 | 90 |
| C-23 | 2400 | 3000 | 6 | - | 3'-0" | - | 30 | 12 | 24 | 12 | 3 | 2 | 1½ | 3 | 1600 | 525 | 95 |
| C-24 | 3200 | 4000 | 8 | - | 4'-0" | - | 40 | 16 | 30 | 16 | 4 | 2 | 1½ | 3 | 1850 | 525 | 100 |
| C-33 | 3600 | 4500 | 9 | 3'-0" | 3'-0" | 4'-4" | 45 | 12 | 34 | 18 | 3 | 2½ | 2 | 3 | 1675 | 550 | 96 |
| C-34 | 4800 | 6000 | 12 | - | 4'-0" | - | 60 | 16 | 45 | 24 | 4 | 2½ | 2 | 3 | 2150 | 550 | 103 |
| C-35 | 6000 | 7500 | 15 | - | 5'-0" | - | 75 | 20 | 57 | 30 | 5 | 3 | 2½ | 5 | 2425 | 640 | 110 |
| C-36 | 7200 | 9000 | 18 | - | 6'-0" | - | 90 | 24 | 68 | 36 | 6 | 3 | 2½ | 5 | 2700 | 640 | 116 |
| C-37 | 8400 | 10500 | 21 | - | 7'-0" | - | 105 | 28 | 79 | 42 | 7 | 4 | 3 | 5 | 3000 | 675 | 124 |
| C-43 | 4800 | 6000 | 12 | 4'-0" | 3'-0" | 5'-4" | 60 | 12 | 45 | 24 | 3 | 2½ | 2 | 3 | 2075 | 550 | 100 |
| C-44 | 6400 | 8000 | 16 | - | 4'-0" | - | 80 | 16 | 60 | 32 | 4 | 3 | 2½ | 5 | 2375 | 640 | 107 |
| C-45 | 8000 | 10000 | 20 | - | 5'-0" | - | 100 | 20 | 75 | 40 | 5 | 3 | 2½ | 5 | 2675 | 640 | 114 |
| C-46 | 9600 | 12000 | 24 | - | 6'-0" | - | 120 | 24 | 90 | 48 | 6 | 4 | 3 | 5 | 3025 | 675 | 120 |
| C-47 | 11200 | 14000 | 28 | - | 7'-0" | - | 140 | 28 | 105 | 56 | 7 | 4 | 3 | 7½ | 3325 | 725 | 127 |
| C-48 | 12800 | 16000 | 32 | - | 8'-0" | - | 160 | 32 | 120 | 64 | 8 | 4 | 3 | 7½ | 3650 | 725 | 134 |
| C-53 | 6000 | 7500 | 15 | 5'-0" | 3'-0" | 6'-4" | 75 | 12 | 57 | 30 | 3 | 3 | 2½ | 5 | 2325 | 640 | 104 |
| C-54 | 8000 | 10000 | 20 | - | 4'-0" | - | 100 | 16 | 75 | 40 | 4 | 3 | 2½ | 5 | 2650 | 640 | 111 |
| C-55 | 10000 | 12500 | 25 | - | 5'-0" | - | 125 | 20 | 94 | 50 | 5 | 4 | 3 | 5 | 3000 | 675 | 118 |
| C-56 | 12000 | 15000 | 30 | - | 6'-0" | - | 150 | 24 | 113 | 60 | 6 | 4 | 3 | 7½ | 3350 | 725 | 124 |
| C-57 | 14000 | 17500 | 35 | - | 7'-0" | - | 175 | 28 | 131 | 70 | 7 | 4 | 3 | 7½ | 3900 | 725 | 131 |
| C-58 | 16000 | 20000 | 40 | - | 8'-0" | - | 200 | 32 | 150 | 80 | 8 | 5 | 4 | 7½ | 4300 | 925 | 138 |
| C-59 | 18000 | 22500 | 45 | - | 9'-0" | - | 225 | 36 | 168 | 90 | 9 | 5 | 4 | 10 | 4650 | 1000 | 145 |
| C-64 | 9600 | 12000 | 24 | 6'-0" | 4'-0" | 7'-4" | 120 | 16 | 90 | 48 | 4 | 4 | 3 | 5 | 3025 | 675 | 115 |
| C-65 | 12000 | 15000 | 30 | - | 5'-0" | - | 150 | 20 | 113 | 60 | 5 | 4 | 3 | 7½ | 3450 | 725 | 122 |
| C-66 | 14400 | 18000 | 36 | - | 6'-0" | - | 180 | 24 | 135 | 72 | 6 | 4 | 3 | 7½ | 4075 | 725 | 126 |
| C-67 | 16800 | 21000 | 42 | - | 7'-0" | - | 210 | 28 | 157 | 84 | 7 | 5 | 4 | 7½ | 4500 | 925 | 133 |
| C-68 | 19200 | 24000 | 48 | - | 8'-0" | - | 240 | 32 | 180 | 96 | 8 | 5 | 4 | 10 | 4925 | 1000 | 140 |
| C-69 | 21600 | 27000 | 54 | - | 9'-0" | - | 270 | 36 | 203 | 108 | 9 | 5 | 4 | 15 | 5300 | 1200 | 147 |
| C-610 | 24000 | 30000 | 60 | - | 10'-0" | - | 300 | 40 | 225 | 120 | 10 | 5 | 4 | 15 | 5700 | 1200 | 153 |
| C-611 | 26200 | 33000 | 66 | - | 11'-0" | - | 330 | 44 | 248 | 132 | 11 | 5 | 4 | 15 | 6125 | 1200 | 160 |
| C-612 | 28800 | 36000 | 72 | - | 12'-0" | - | 360 | 48 | 270 | 144 | 12 | 5 | 4 | 15 | 6525 | 1200 | 167 |
| C-75 | 14000 | 17500 | 35 | 7'-0" | 5'-0" | 8'-4" | 175 | 20 | 130 | 70 | 5 | 4 | 3 | 7½ | 3725 | 725 | 126 |
| C-76 | 16800 | 21000 | 42 | - | 6'-0" | - | 210 | 24 | 157 | 84 | 6 | 5 | 4 | 7½ | 4450 | 925 | 132 |
| C-77 | 19600 | 24500 | 49 | - | 7'-0" | - | 245 | 28 | 184 | 98 | 7 | 5 | 4 | 10 | 5075 | 1000 | 139 |
| C-78 | 22400 | 28000 | 56 | - | 8'-0" | - | 280 | 32 | 210 | 112 | 8 | 5 | 4 | 15 | 5550 | 1200 | 146 |
| C-79 | 25200 | 31500 | 63 | - | 9'-0" | - | 315 | 36 | 236 | 126 | 9 | 5 | 4 | 15 | 6000 | 1200 | 153 |
| C-710 | 28000 | 35000 | 70 | - | 10'-0" | - | 350 | 40 | 263 | 140 | 10 | 5 | 4 | 15 | 6495 | 1200 | 159 |
| C-711 | 31800 | 38500 | 77 | - | 11'-0" | - | 385 | 44 | 290 | 154 | 11 | 6 | 5 | 15 | 6950 | 1500 | 166 |
| C-712 | 33600 | 42000 | 84 | - | 12'-0" | - | 420 | 48 | 315 | 168 | 12 | 6 | 5 | 15 | 7575 | 1500 | 173 |
| C-86 | 19200 | 24000 | 48 | 8'-0" | 6'-0" | 9'-4" | 240 | 24 | 180 | 96 | 6 | 5 | 4 | 10 | 4900 | 1000 | 155 |
| C-87 | 22400 | 28000 | 56 | - | 7'-0" | - | 280 | 28 | 210 | 112 | 7 | 5 | 4 | 10 | 5525 | 1000 | 163 |
| C-88 | 25600 | 32000 | 64 | - | 8'-0" | - | 320 | 32 | 240 | 128 | 8 | 5 | 4 | 15 | 6050 | 1200 | 170 |
| C-89 | 28800 | 36000 | 72 | - | 9'-0" | - | 360 | 36 | 270 | 144 | 9 | 5 | 4 | 15 | 6600 | 1200 | 178 |
| C-810 | 32000 | 40000 | 80 | - | 10'-0" | - | 400 | 40 | 300 | 160 | 10 | 6 | 5 | 15 | 7075 | 1500 | 184 |
| C-811 | 35200 | 44000 | 88 | - | 11'-0" | - | 440 | 44 | 330 | 176 | 11 | 6 | 5 | 15 | 7550 | 1500 | 192 |
| C-812 | 38400 | 48000 | 96 | - | 12'-0" | - | 480 | 48 | 360 | 192 | 12 | 6 | 5 | 20 | 8275 | 1680 | 199 |
| C-813 | 41600 | 52000 | 104 | - | 13'-0" | - | 520 | 52 | 390 | 208 | 13 | 6 | 5 | 20 | 8750 | 1650 | 207 |
| C-814 | 44800 | 56000 | 112 | - | 14'-0" | - | 560 | 56 | 420 | 224 | 14 | 8 | 6 | 25 | 9300 | 2100 | 215 |
| C-97 | 25200 | 31500 | 63 | 9'-0" | 7'-0" | 10'-4" | 315 | 28 | 236 | 126 | 7 | 5 | 4 | 15 | 5925 | 1200 | 172 |
| C-98 | 28800 | 36000 | 72 | - | 8'-0" | - | 360 | 32 | 270 | 144 | 8 | 5 | 4 | 15 | 6525 | 1200 | 179 |
| C-99 | 32400 | 40500 | 81 | - | 9'-0" | - | 405 | 36 | 304 | 162 | 9 | 6 | 5 | 15 | 7050 | 1500 | 185 |
| C-910 | 36000 | 45000 | 90 | - | 10'-0" | - | 450 | 40 | 338 | 180 | 10 | 6 | 5 | 15 | 7600 | 1500 | 191 |
| C-911 | 39600 | 49500 | 99 | - | 11'-0" | - | 495 | 44 | 372 | 198 | 11 | 6 | 5 | 20 | 8100 | 1650 | 197 |
| C-912 | 43200 | 54000 | 108 | - | 12'-0" | - | 540 | 48 | 405 | 216 | 12 | 6 | 5 | 20 | 8950 | 1650 | 204 |
| C-913 | 46000 | 58500 | 117 | - | 13'-0" | - | 585 | 52 | 438 | 234 | 13 | 8 | 6 | 25 | 9475 | 2100 | 212 |
| C-914 | 50400 | 63000 | 126 | - | 14'-0" | - | 630 | 56 | 472 | 252 | 14 | 8 | 6 | 25 | 10050 | 2100 | 220 |
| C-915 | 54000 | 67500 | 135 | - | 15'-0" | - | 675 | 60 | 505 | 270 | 15 | 8 | 6 | 25 | 10675 | 2100 | 228 |
| C-916 | 57600 | 72000 | 144 | - | 16'-0" | - | 720 | 64 | 540 | 288 | 16 | 8 | 6 | 30 | 11200 | 2250 | 234 |
| C-107 | 28000 | 35000 | 70 | 10'-0" | 7'-0" | 11'-4" | 350 | 28 | 263 | 140 | 7 | 5 | 4 | 15 | 6375 | 1200 | 181 |
| C-108 | 32000 | 40000 | 80 | - | 8'-0" | - | 400 | 32 | 300 | 160 | 8 | 6 | 5 | 15 | 6975 | 1500 | 186 |
| C-109 | 36000 | 45000 | 90 | - | 9'-0" | - | 450 | 36 | 338 | 180 | 9 | 6 | 5 | 15 | 7525 | 1500 | 194 |
| C-1010 | 40000 | 50000 | 100 | - | 10'-0" | - | 500 | 40 | 375 | 200 | 10 | 6 | 5 | 20 | 8075 | 1650 | 200 |
| C-1011 | 44000 | 55000 | 110 | - | 11'-0" | - | 550 | 44 | 412 | 220 | 11 | 8 | 6 | 25 | 8625 | 2100 | 206 |
| C-1012 | 48000 | 60000 | 120 | - | 12'-0" | - | 600 | 48 | 450 | 240 | 12 | 8 | 6 | 25 | 9525 | 2100 | 213 |
| C-1013 | 52000 | 65000 | 130 | - | 13'-0" | - | 650 | 52 | 488 | 260 | 13 | 8 | 6 | 25 | 10200 | 2100 | 221 |
| C-1014 | 56000 | 70000 | 140 | - | 14'-0" | - | 700 | 56 | 525 | 280 | 14 | 8 | 6 | 25 | 10800 | 2100 | 227 |
| C-1015 | 60000 | 75000 | 150 | - | 15'-0" | - | 750 | 60 | 562 | 300 | 15 | 8 | 6 | 30 | 11350 | 2250 | 235 |
| C-1016 | 64000 | 80000 | 160 | - | 16'-0" | - | 800 | 64 | 600 | 320 | 16 | 8 | 6 | 30 | 12000 | 2250 | 243 |
| C-1017 | 68000 | 85000 | 170 | - | 17'-0" | - | 850 | 68 | 638 | 340 | 17 | 8 | 6 | 30 | 12800 | 2250 | 250 |
| C-1018 | 72000 | 90000 | 180 | - | 18'-0" | - | 900 | 72 | 675 | 360 | 18 | 8 | 6 | 30 | 13400 | 2250 | 258 |
| C-1019 | 76000 | 95000 | 190 | - | 19'-0" | - | 950 | 76 | 712 | 380 | 19 | 10 | 8 | 30 | 13950 | 2400 | 266 |
| C-1020 | 80000 | 100000 | 200 | - | 20'-0" | - | 1000 | 80 | 750 | 400 | 20 | 10 | 8 | 30 | 14500 | 2400 | 273 |
| C-1021 | 84000 | 105000 | 210 | - | 21'-0" | - | 1050 | 84 | 788 | 420 | 21 | 10 | 8 | 30 | 15100 | 2400 | 281 |
| C-1022 | 88000 | 110000 | 220 | - | 22'-0" | - | 1100 | 88 | 825 | 440 | 22 | 10 | 8 | 30 | 15650 | 2400 | 289 |
| C-1023 | 92000 | 115000 | 230 | - | 23'-0" | - | 1150 | 92 | 862 | 460 | 23 | 10 | 8 | 40 | 16200 | 2650 | 296 |
| C-1024 | 96000 | 120000 | 240 | - | 24'-0" | - | 1200 | 96 | 900 | 480 | 24 | 10 | 8 | 40 | 16800 | 2650 | 304 |

# Massachusetts Type V Modified Unit Heater



ExteriorView



Side Panel Removed To Show Interior

## The Massachusetts Type V Modified Unit Heater

The Bishop & Babcock line of Massachusetts Unit Heaters presents the latest, most efficient and economical means of heating and ventilating large areas, such as manufacturing plants, factory offices, gymnasiums, commercial garages, etc.

The design is in strict accordance with the fundamental laws of scientific air circulation. The unit, drawing cool air from a point just above the floor level, and discharging horizontally at high velocity just above the breathing or working zone, distributes the heated air in the breathing zone.

Heated air can be deflected downward by means of baffles, etc., but will rebound upward unless the cooler air, at the lower levels, is withdrawn. The air inlet of Massachusetts Unit Heaters, being just above the floor line, removes the lower strata of cool air, allowing the warmer strata in the breathing zone to fall, thus insuring a uniform temperature.

### Distinctive features of Massachusetts Type V Unit Heaters

1—The design of the Unit Heater is such as to enhance the appearance of its surroundings, replacing unsightly units with an efficient, mechanically correct means of heating. Ornamental grilles of pleasing appearance replace the usual cowls, elbows and baffles.

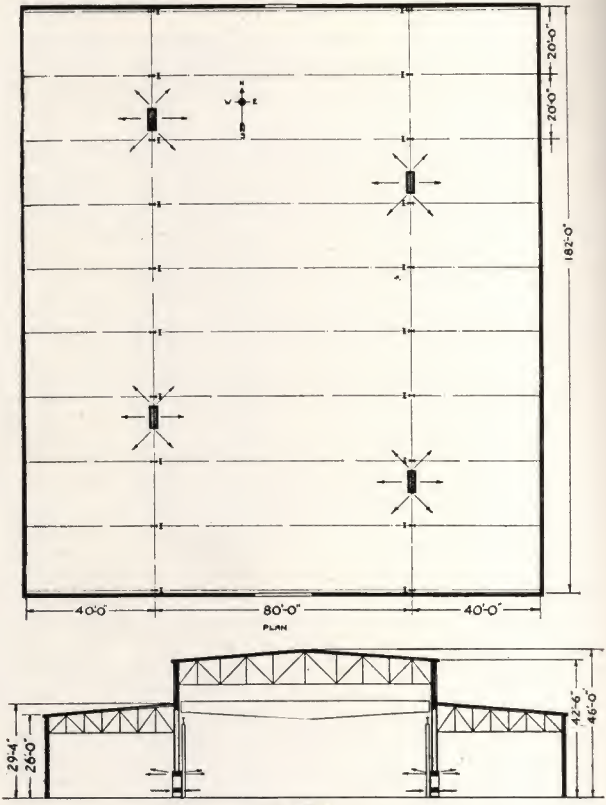
2—The high pressure finned radiation of copper and brass, is suitable for any steam pressure up to 100 pounds, and is tested before shipment to 200 pounds hydrostatic pressure.

3—The Massachusetts Unit Heater is of rigid construction and silent in operation, featuring multiblade fans of high efficiency, direct connected to low speed motors, establishing a new standard for unit heater performance.

4—At a slight increase in price, the Massachusetts Unit Heater can be furnished with air filters of approved design built into the unit, insuring a circulation of air at least 98% clean, and arranged with double connected Louvre dampers so that air may be drawn from out of doors or recirculated as desired.

5—Positive control of heat is assured at all times. This may be accomplished by manual control or by means of the Bishop & Babcock System of Automatic Temperature Regulation, insuring constant and uniform temperatures in all areas.

6—Massachusetts Unit Heaters are shipped assembled, ready for operation. When in position, only steam and electrical connections are necessary. Being designed for floor mounting, no elaborate foundations or supports are necessary.



TYPICAL LAYOUT MASSACHUSETTS TYPE V MODIFIED UNIT HEATERS IN MANUFACTURING BUILDING.

## Advantages of the Massachusetts Type V Unit System of Heating

The Massachusetts Unit System of Heating, as compared to the Direct Radiation System, effects numerous advantages and savings, both in first cost and in operating and maintenance expense, for the following reasons:

The First cost will be from twenty to forty per cent less, as the radiation used in Massachusetts Unit Heaters has more than five times the heating efficiency of direct radiation, and the elaborate piping system necessary in the use of direct radiation is omitted.

## Advantages of the Massachusetts Type V Unit System of Heating

An even distribution of heat is assured, eliminating the necessity of maintaining a temperature at the ceiling 15° to 20° in excess of that desired at the breathing zone.

Each heater is a self contained unit, and can be shut off when not required. Heat supply for each section of the building is, therefore, controlled at will.

Due to the type of radiation used, the heating effect of Massachusetts Unit Heaters is almost instantaneous. The heating up period, in the morning, is reduced to a fraction of that required with a direct radiation system.

The cost of maintenance is reduced to a minimum, due to the rigid construction of the unit and practical elimination of expansion and contraction found in long runs of coil or wall radiation. Ventilation as well as heating is secured. The system can be so arranged that any portion of the air displaced can be drawn from out of doors, effecting an ideal Heating and Ventilating System during the colder months, and a Ventilation System in the summer.

## Construction Details of Massachusetts Type V Unit Heaters

**Fans:**

Two standard Massachusetts Modified Squirrel Cage Fans, mounted on same shaft, are used. The casings are of blue annealed open hearth steel strongly braced, bolted and riveted. The wheels are designed to combine rigid construction and great strength, together with efficient and noiseless operation.

**Motor:**

Motors of standard manufacture are used, fitted with double shaft extension for direct connection to fans. Arrangement has been made for oiling motors from outside by means of oil sights on heater casings.

**Starter:**

Starting switches are regularly furnished as standard equipment, and are mounted on side of heater casing.

**Casing:**

The casing is constructed of blue annealed open hearth steel, mounted on a rigid structural steel frame, and fitted with access door and removable side panels. The casing is furnished with lace pattern steel grilles for distributing the heated air in three or four directions as desired.

**Heating Coils:**

Radiation used in all types of Massachusetts Unit Heaters is the Arcoblast Heating Coil furnished in three, four or five tubes deep, and one or two sections, depending on size of heater and requirements of the particular installation.

Arcoblast Heating Coil

The heater consists of heavy ¾″ copper tubes. Each tube is wrapped with a thin copper radial fin, giving a helical form. These fins, which are tinned to the tubes to insure a perfect bond, are of proper width to give maximum heat transfer with minimum tube spacing, and the pitch of the helix is such as to give maximum surface without undue air resistance.

The tubes are mounted between heavy cast iron tube sheets and rolled into holes in these sheets to insure a leak proof joint under all operating conditions.

The headers are of close grain cast iron, the return header having eccentric tapping to prevent accumulation of condensate in the heater section.

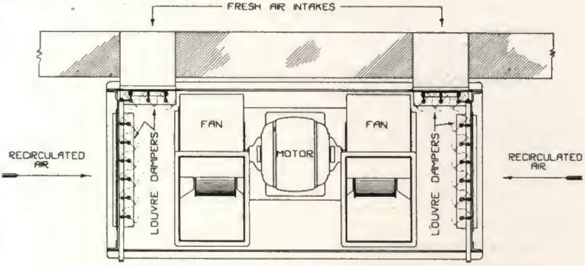
Heater Sections are tested at 200 pounds hydraulic pressure before shipment.

## The Massachusetts Type V F Modified Unit Heater

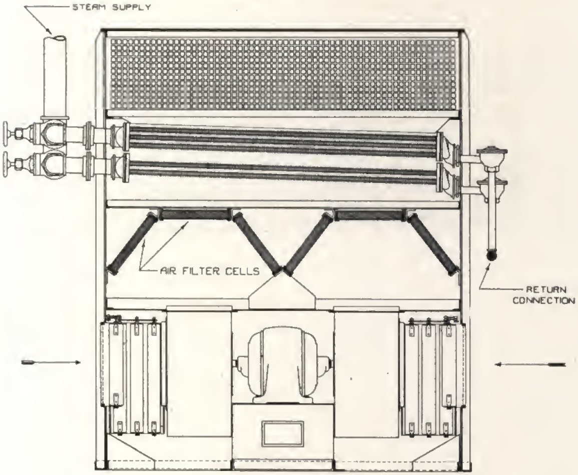
The Massachusetts Type V F Modified Unit Heater presents an innovation in the unit heating field, presenting a unit in which is incorporated, as standard equipment, a positive and effective means of removing all dirt, dust, soot and other impurities in the incoming or recirculated air, and a system of damper control, either manual or automatic, which permits any portion of the air to be drawn from out of doors or recirculated from the building as desired.

## Massachusetts Type V F Modified Unit Heater

The filtering media consists of filter cells of standard manufacture fitted in the unit, and arranged for easy removal for cleaning.



PLAN

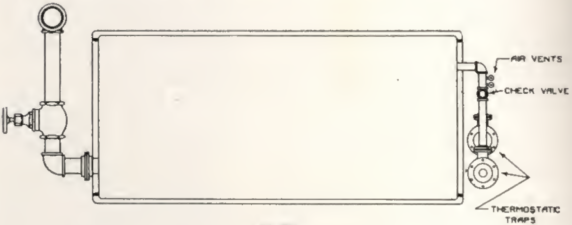


SECTIONAL ELEVATION

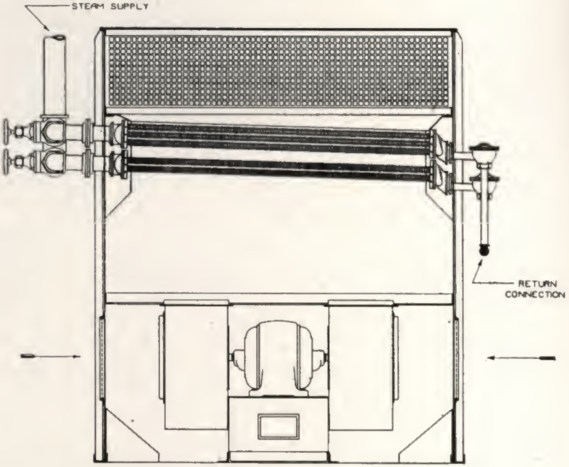
The arrangement of air inlets to the unit is such as to permit installation along outer walls, or the unit may be installed in any other manner with fresh air intake ducts extending to outside of building.

The Massachusetts Type V F Modified Unit Heater can be furnished with Humidifiers, Bishop & Babcock Humidity Control, and the Bishop & Babcock System of Temperature Regulation to suit air conditioning requirements of the particular installation.

## Massachusetts Type V Modified Unit Heater



PLAN



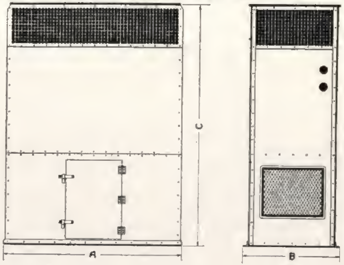
SECTIONAL ELEVATION

## DIMENSIONS AND PHYSICAL DATA

| Heater Size | Principal Dimensions | | | Capacity C. F. M. @ 68° F | Size Tapping | | Steam Connections | | |
|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | | Supply | Return | Supply | Return | |
| | | | | | | | | Gravity | Vacuum |
| 353 | 3′-10″ | 3′-2″ | 7′- 8″ | 3500 | 1-3″ | 1-1″ | 3″ | 1½″ | 1″ |
| 354 | 3′-10″ | 3′-2″ | 7′- 8″ | 3400 | 2-3″ | 2-1″ | 3½″ | 1½″ | 1″ |
| 355 | 3′-10″ | 3′-2″ | 7′- 8″ | 3300 | 2-3″ | 2-1″ | 3½″ | 2″ | 1¼″ |
| 503 | 5′- 4″ | 3′-2″ | 7′- 8″ | 5300 | 1-3″ | 1-1¼″ | 3½″ | 1½″ | 1¼″ |
| 504 | 5′- 4″ | 3′-2″ | 7′- 8″ | 5150 | 2-3″ | 2-1¼″ | 4″ | 2″ | 1¼″ |
| 505 | 5′- 4″ | 3′-2″ | 7′- 8″ | 5000 | 2-3″ | 2-1¼″ | 4″ | 2″ | 1¼″ |
| 623 | 5′-10″ | 3′-2″ | 7′- 9″ | 6400 | 1-3″ | 1-1¼″ | 4″ | 2″ | 1¼″ |
| 624 | 5′-10″ | 3′-2″ | 7′- 9″ | 6275 | 2-3″ | 2-1¼″ | 4″ | 2″ | 1¼″ |
| 625 | 5′-10″ | 3′-2″ | 7′- 9″ | 6150 | 2-3″ | 2-1¼″ | 4½″ | 2½″ | 1¼″ |
| 753 | 6′-10″ | 3′-2″ | 7′-10¼″ | 7680 | 1-3″ | 1-1¼″ | 4″ | 2″ | 1¼″ |
| 754 | 6′-10″ | 3′-2″ | 7′-10¼″ | 7470 | 2-3″ | 2-1¼″ | 4½″ | 2½″ | 1¼″ |
| 755 | 6′-10″ | 3′-2″ | 7′-10¼″ | 7200 | 2-3″ | 2-1¼″ | 4½″ | 2½″ | 1½″ |
| 903 | 7′- 4″ | 3′-2″ | 7′-10¼″ | 9360 | 1-3″ | 1-1½″ | 4″ | 2″ | 1¼″ |
| 904 | 7′- 4″ | 3′-2″ | 7′-10¼″ | 9160 | 2-3″ | 2-1¼″ | 4½″ | 2½″ | 1½″ |
| 905 | 7′- 4″ | 3′-2″ | 7′-10¼″ | 9000 | 2-3″ | 2-1½″ | 4½″ | 2½″ | 1½″ |

| Heater Size | Dia. Fan Wheels | R. P. M. | B. H. P. | H. P. Motor | RADIATION DATA | | | Shipping Weight |
|---|---|---|---|---|---|---|---|---|
| | | | | | Rows Tubes Deep | Length Tubes | Lin. Ft. Tubing | |
| 353 | 12″ | 1150 | 1.48 | 1½ | 3 | 31″ | 114′ | 1800 |
| 354 | 12″ | 1150 | 1.44 | 1½ | 4 | 31″ | 150 | 1950 |
| 355 | 12″ | 1150 | 1.40 | 1½ | 5 | 31″ | 189 | 1980 |
| 503 | 15″ | 690 | 1.30 | 1½ | 3 | 49″ | 180 | 2350 |
| 504 | 15″ | 690 | 1.28 | 1½ | 4 | 49″ | 238 | 2500 |
| 505 | 15″ | 690 | 1.25 | 1½ | 5 | 49″ | 299 | 2530 |
| 623 | 15″ | 850 | 2.04 | 2½ | 3 | 55″ | 202 | 2400 |
| 624 | 15″ | 850 | 2.00 | 2½ | 4 | 55″ | 266 | 2600 |
| 625 | 15″ | 850 | 1.95 | 2½ | 5 | 55″ | 335 | 2640 |
| 753 | 18″ | 570 | 1.88 | 2 | 3 | 67″ | 246 | 2750 |
| 754 | 18″ | 570 | 1.86 | 2 | 4 | 67″ | 324 | 2960 |
| 755 | 18″ | 570 | 1.80 | 2 | 5 | 67″ | 408 | 3000 |
| 903 | 18″ | 690 | 3.19 | 4 | 3 | 73″ | 268 | 3050 |
| 904 | 18″ | 690 | 3.16 | 4 | 4 | 73″ | 354 | 3250 |
| 905 | 18″ | 690 | 3.12 | 4 | 5 | 73″ | 445 | 3300 |

MASSACHUSETTS
TYPE V MODIFIED UNIT HEATER

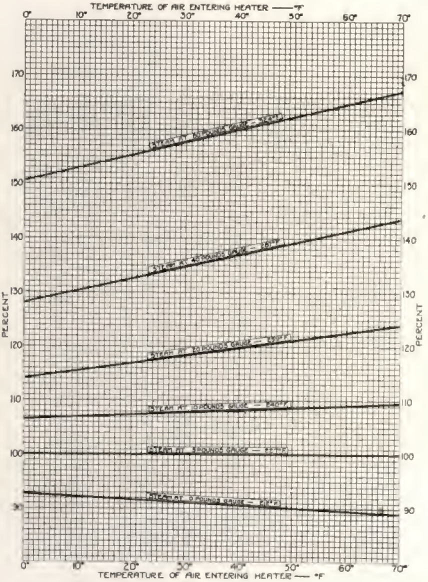


STEAM AT 227° & 5 POUNDS GAUGE

| Heater Size | Capac. C.F.M. | Temperature | | B. T. U. Emission Per Hour | Cond. Per Hour Pounds | Equiv. Sq. Ft. Direct Radiation |
|---|---|---|---|---|---|---|
| | | Air Entering Heater | Air Leaving Heater | | | |
| 353 | 3550 | 0° | 76° | 291,000 | 304 | 1160 |
| | 3600 | 10 | 83 | 279,000 | 290 | 1115 |
| | 3645 | 20 | 90 | 266,000 | 277 | 1060 |
| | 3690 | 30 | 97 | 253,000 | 264 | 1010 |
| | 3735 | 40 | 103 | 240,000 | 250 | 960 |
| | 3780 | 50 | 110 | 228,000 | 237 | 910 |
| | 3820 | 60 | 116 | 213,000 | 222 | 850 |
| | 3975 | 70 | 123 | 200,000 | 210 | 800 |
| 354 | 3580 | 0 | 96 | 357,000 | 372 | 1430 |
| | 3620 | 10 | 102 | 340,000 | 354 | 1360 |
| | 3660 | 20 | 108 | 325,000 | 338 | 1300 |
| | 3695 | 30 | 113 | 309,000 | 322 | 1235 |
| | 3725 | 40 | 119 | 293,000 | 306 | 1170 |
| | 3770 | 50 | 125 | 277,000 | 289 | 1110 |
| | 3800 | 60 | 131 | 261,000 | 272 | 1040 |
| | 3840 | 70 | 137 | 245,000 | 256 | 980 |
| 355 | 3600 | 0 | 115 | 415,000 | 433 | 1660 |
| | 3630 | 10 | 120 | 396,000 | 413 | 1585 |
| | 3650 | 20 | 124 | 378,000 | 393 | 1510 |
| | 3690 | 30 | 130 | 360,000 | 376 | 1440 |
| | 3720 | 40 | 135 | 343,000 | 357 | 1370 |
| | 3750 | 50 | 140 | 324,000 | 338 | 1295 |
| | 3780 | 60 | 145 | 305,000 | 318 | 1220 |
| | 3810 | 70 | 150 | 287,000 | 299 | 1145 |
| 503 | 5380 | 0 | 77 | 452,000 | 470 | 1800 |
| | 5460 | 10 | 84 | 430,000 | 448 | 1720 |
| | 5540 | 20 | 91 | 410,000 | 426 | 1640 |
| | 5600 | 30 | 97 | 390,000 | 406 | 1560 |
| | 5660 | 40 | 104 | 371,000 | 386 | 1480 |
| | 5730 | 50 | 111 | 352,000 | 366 | 1405 |
| | 5800 | 60 | 117 | 330,000 | 344 | 1320 |
| | 5860 | 70 | 124 | 311,000 | 324 | 1240 |
| 504 | 5450 | 0 | 98 | 552,000 | 575 | 2200 |
| | 5510 | 10 | 104 | 528,000 | 550 | 2110 |
| | 5560 | 20 | 109 | 504,000 | 525 | 2015 |
| | 5610 | 30 | 115 | 480,000 | 500 | 1920 |
| | 5670 | 40 | 121 | 454,000 | 473 | 1815 |
| | 5720 | 50 | 126 | 428,000 | 447 | 1715 |
| | 5770 | 60 | 132 | 404,000 | 421 | 1615 |
| | 5840 | 70 | 138 | 380,000 | 396 | 1520 |
| 505 | 5470 | 0 | 117 | 638,000 | 665 | 2550 |
| | 5520 | 10 | 122 | 613,000 | 639 | 2450 |
| | 5560 | 20 | 127 | 582,000 | 607 | 2330 |
| | 5600 | 30 | 132 | 556,000 | 579 | 2220 |
| | 5660 | 40 | 137 | 528,000 | 590 | 2110 |
| | 5700 | 50 | 141 | 500,000 | 520 | 2000 |
| | 5740 | 60 | 146 | 471,000 | 491 | 1885 |
| | 5790 | 70 | 151 | 442,000 | 460 | 1765 |
| 623 | 6500 | 0 | 76 | 528,000 | 550 | 2110 |
| | 6580 | 10 | 83 | 504,000 | 525 | 2020 |
| | 6660 | 20 | 90 | 485,000 | 505 | 1940 |
| | 6740 | 30 | 96 | 458,000 | 478 | 1830 |
| | 6820 | 40 | 103 | 436,000 | 454 | 1740 |
| | 6900 | 50 | 110 | 415,000 | 433 | 1660 |
| | 6980 | 60 | 116 | 388,000 | 405 | 1550 |
| | 7060 | 70 | 123 | 367,000 | 382 | 1465 |
| 624 | 6600 | 0 | 96 | 646,000 | 673 | 2580 |
| | 6670 | 10 | 101 | 620,000 | 645 | 2480 |
| | 6740 | 20 | 107 | 590,000 | 615 | 2360 |
| | 6820 | 30 | 113 | 560,000 | 584 | 2240 |
| | 6890 | 40 | 119 | 533,000 | 555 | 2130 |
| | 6960 | 50 | 125 | 504,000 | 525 | 2020 |
| | 7025 | 60 | 130 | 474,000 | 494 | 1895 |
| | 7090 | 70 | 136 | 447,000 | 465 | 1780 |

STEAM AT 227° & 5 POUNDS GAUGE

| Heater Size | Capac. C.F.M. | Temperature | | B. T. U. Emission Per Hour | Cond. Per Hour Pounds | Equiv. Sq. Ft. Direct Radiation |
|---|---|---|---|---|---|---|
| | | Air Entering Heater | Air Leaving Heater | | | |
| 625 | 6690 | 0° | 114° | 765,000 | 797 | 3050 |
| | 6750 | 10 | 119 | 730,000 | 762 | 2920 |
| | 6810 | 20 | 124 | 697,000 | 726 | 2780 |
| | 6870 | 30 | 129 | 664,000 | 692 | 2650 |
| | 6920 | 40 | 134 | 632,000 | 658 | 2520 |
| | 6980 | 50 | 139 | 597,000 | 622 | 2380 |
| | 7040 | 60 | 144 | 563,000 | 587 | 2250 |
| | 7090 | 70 | 148 | 530,000 | 552 | 2120 |
| 753 | 7790 | 0 | 76 | 637,000 | 664 | 2550 |
| | 7900 | 10 | 83 | 608,000 | 634 | 2430 |
| | 8000 | 20 | 90 | 583,000 | 606 | 2330 |
| | 8100 | 30 | 96 | 552,000 | 575 | 2210 |
| | 8200 | 40 | 103 | 526,000 | 548 | 2100 |
| | 8300 | 50 | 110 | 496,000 | 517 | 1980 |
| | 8400 | 60 | 116 | 468,000 | 487 | 1870 |
| | 8500 | 70 | 123 | 440,000 | 459 | 1760 |
| 754 | 7860 | 0 | 96 | 785,000 | 816 | 3140 |
| | 7950 | 10 | 102 | 750,000 | 780 | 3000 |
| | 8040 | 20 | 108 | 715,000 | 745 | 2860 |
| | 8130 | 30 | 114 | 680,000 | 708 | 2720 |
| | 8220 | 40 | 120 | 646,000 | 674 | 2580 |
| | 8300 | 50 | 125 | 610,000 | 635 | 2440 |
| | 8375 | 60 | 130 | 575,000 | 598 | 2300 |
| | 8450 | 70 | 136 | 542,000 | 564 | 2160 |
| 755 | 7850 | 0 | 115 | 902,000 | 940 | 3600 |
| | 7920 | 10 | 120 | 865,000 | 900 | 3450 |
| | 7980 | 20 | 125 | 825,000 | 860 | 3300 |
| | 8050 | 30 | 130 | 785,000 | 819 | 3140 |
| | 8125 | 40 | 135 | 745,000 | 776 | 2980 |
| | 8190 | 50 | 140 | 706,000 | 735 | 2820 |
| | 8260 | 60 | 145 | 667,000 | 695 | 2660 |
| | 8330 | 70 | 150 | 625,000 | 650 | 2500 |
| 903 | 9450 | 0 | 73 | 745,000 | 775 | 2980 |
| | 9580 | 10 | 80 | 713,000 | 742 | 2860 |
| | 9700 | 20 | 87 | 678,000 | 707 | 2720 |
| | 9825 | 30 | 94 | 646,000 | 672 | 2580 |
| | 9950 | 40 | 100 | 613,000 | 639 | 2450 |
| | 10050 | 50 | 107 | 581,000 | 605 | 2320 |
| | 10180 | 60 | 114 | 545,000 | 568 | 2180 |
| | 10320 | 70 | 121 | 515,000 | 537 | 2060 |
| 904 | 9560 | 0 | 92 | 919,000 | 956 | 3670 |
| | 9710 | 10 | 99 | 880,000 | 917 | 3520 |
| | 9820 | 20 | 105 | 843,000 | 878 | 3370 |
| | 9920 | 30 | 111 | 796,000 | 830 | 3180 |
| | 10000 | 40 | 116 | 758,000 | 790 | 3030 |
| | 10100 | 50 | 122 | 718,000 | 748 | 2880 |
| | 10200 | 60 | 128 | 677,000 | 705 | 2710 |
| | 10310 | 70 | 134 | 637,000 | 663 | 2540 |
| 905 | 9725 | 0 | 110 | 1,080,000 | 1125 | 4330 |
| | 9810 | 10 | 115 | 1,030,000 | 1072 | 4150 |
| | 9910 | 20 | 121 | 988,000 | 1028 | 3950 |
| | 10000 | 30 | 126 | 940,000 | 980 | 3760 |
| | 10100 | 40 | 132 | 895,000 | 932 | 3580 |
| | 10200 | 50 | 137 | 846,000 | 880 | 3380 |
| | 10300 | 60 | 142 | 800,000 | 833 | 3200 |
| | 10390 | 70 | 147 | 748,000 | 778 | 2990 |



**Percentage Curves showing changes in B. T. U. Emission of Massachusetts Unit Heaters for Various Steam Pressures and Temperatures of entering air.**

Based on 5 lbs. Gauge 227° F. as 100.

NOTE—To obtain B. T. U. Emission of any size Massachusetts Unit Heater at any steam pressure and entering air temperature, multiply percentage constant from curve by basic rating in B. T. U.'s at 5 lbs. steam which is given in tables on pages 204, 205, 209, 211 and 213.

The capacity ratings given above are average results of a series of tests conducted as follows:

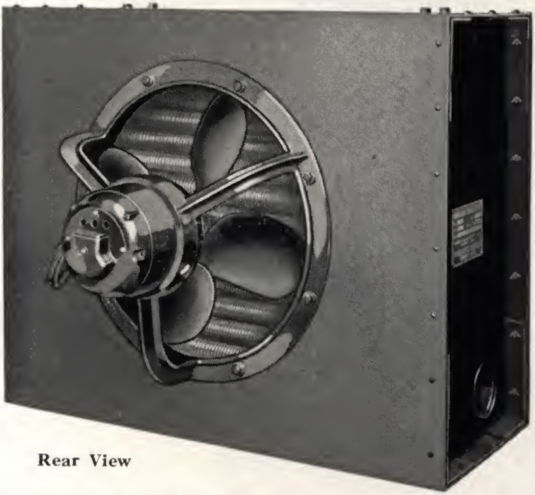
1—Five pounds steam 227° F. maintained constant in heater. Pressure determined by a steam thermometer, heater air vented, gravity return.

2—Dry saturated steam supplied. Separator and trap in supply main to remove entrained water.

3—Condensation discharged to receptacle on platform scales where it is weighed. Cooling leg on return to reduce re-evaporation to a minimum.

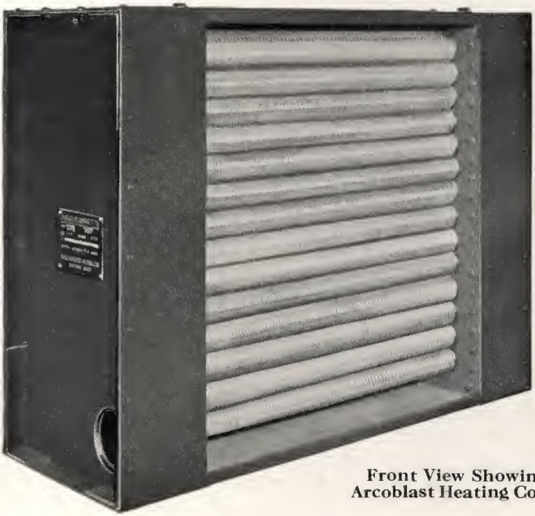
4—B. T. U. and air quantities calculated from condensation and air temperatures. Entering and final temperatures of air recorded as an average over air inlet and outlet areas.

## Massachusetts Type H Modified Unit Heater



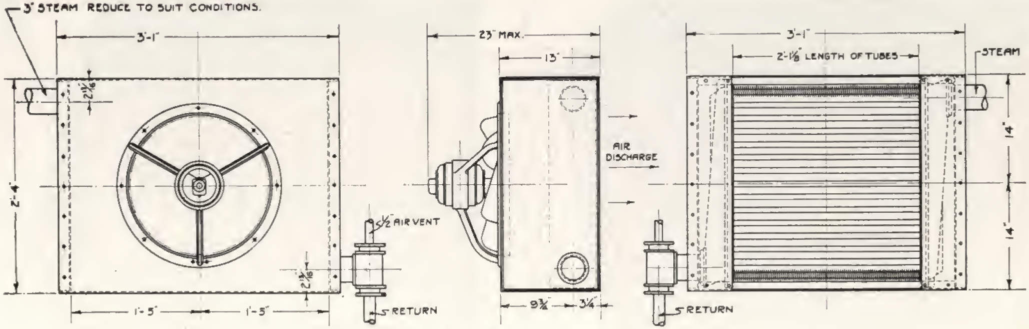
Rear View

Where floor space is not available we recommend Ceiling Type H Unit Heaters, built in three sizes, 18″, 24″ and 30″. Deflector plates and re-circulating boxes can be furnished if required.



Front View Showing Arcoblast Heating Coils

## Type "H" Modified Unit Heater Size 18



### PHYSICAL DATA

**Fan:**—18″ Super Hi-Lo Massachusetts Electric Propeller Fan.

**Motor:**—Totally enclosed automatically lubricated.

**Heater:**—No. 25—¾″ copper tubes, 1½″ copper helical fins, cast iron header and tube sheet, with tubes rolled into holes in tube sheets.

Standard type for steam pressures to 50 pounds.

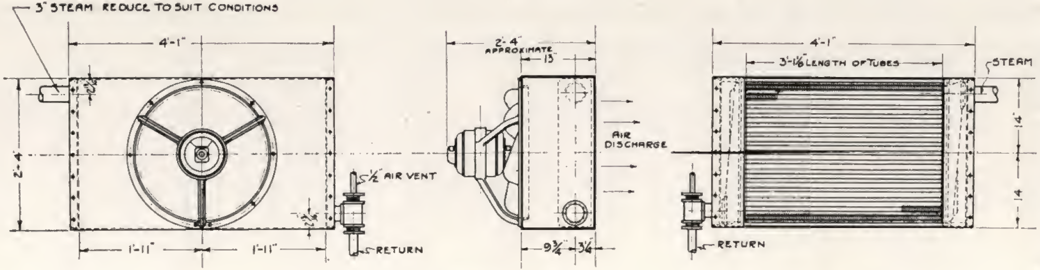
High pressure type for steam pressures to 150 pounds.

## PERFORMANCE DATA — TYPE H MODIFIED UNIT HEATER SIZE 18

| Depth of Heater | 1/10 H. P.—850 R. P. M. 1650 CUBIC FEET OF AIR PER MINUTE | | | | | 1/6 H. P.—1150 R. P. M. 2200 CUBIC FEET OF AIR PER MINUTE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Temperature Rise | | B. T. U. Per Hr. | Condensate Per Hr. | Equiv. Sq. Ft. Direct Radiation | Temperature Rise | | B. T. U. Per Hr. | Condensate Per Hr. | Equiv. Sq. Ft. Direct Radiation |
| | From | To | | | | From | To | | | |
| 2 Rows Tubes | 0° | 68° | 116,000 | 121 | 465 | 0° | 61° | 136,200 | 142 | 545 |
| | 30° | 89° | 101,000 | 105 | 405 | 30° | 82° | 119,000 | 124 | 476 |
| | 40° | 96° | 96,000 | 100 | 384 | 40° | 90° | 113,000 | 118 | 452 |
| | 50° | 103° | 90,400 | 94 | 361 | 50° | 97° | 106,900 | 111 | 428 |
| | 60° | 110° | 86,400 | 90 | 345 | 60° | 104° | 100,800 | 105 | 404 |
| | 70° | 117° | 80,500 | 84 | 321 | 70° | 112° | 95,000 | 99 | 380 |
| 3 Rows Tubes | 0° | 95° | 164,000 | 170 | 656 | 0° | 85° | 193,000 | 201 | 775 |
| | 30° | 112° | 142,000 | 148 | 570 | 30° | 104° | 168,500 | 176 | 675 |
| | 40° | 118° | 134,200 | 140 | 538 | 40° | 110° | 159,000 | 165 | 638 |
| | 50° | 123° | 128,000 | 133 | 513 | 50° | 116° | 151,000 | 157 | 605 |
| | 60° | 129° | 120,000 | 125 | 480 | 60° | 123° | 142,000 | 148 | 568 |
| | 70° | 135° | 113,000 | 118 | 452 | 70° | 129° | 133,500 | 139 | 535 |

Note:—Capacities given above are based on steam at 5 pounds gauge, 227° F. For values at other pressures, multiply capacity given above by constant to be found in percentage curves, page 206.

## Type H Modified Unit Heater Size 24



### PHYSICAL DATA

**Fan:**—24″ Super Hi-Lo Massachusetts Electric Propeller Fan.

**Motor:**—Totally enclosed, automatically lubricated.

**Heater:**—No. 37—¾″ copper tubes, 1½″ copper helical fins, cast iron header and tube sheet, with tubes rolled into holes in tube sheets.

Standard type for steam pressures to 50 pounds.

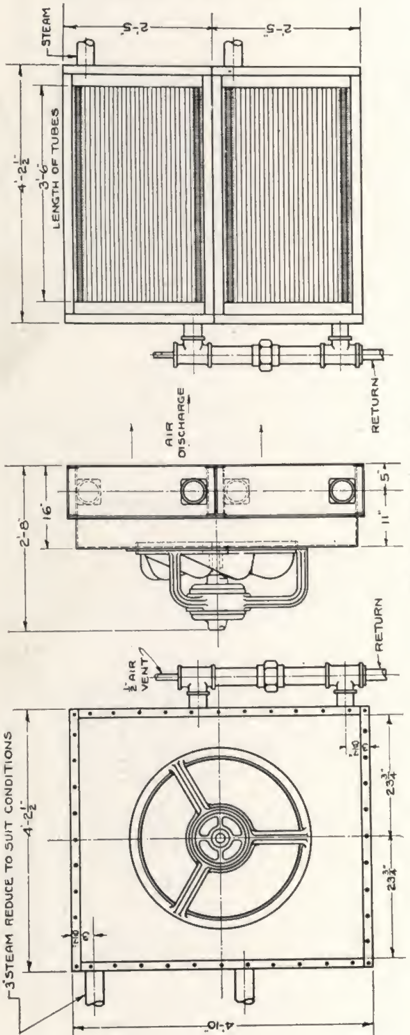
High pressure type for steam pressures to 150 pounds.

## PERFORMANCE DATA TYPE H MODIFIED UNIT HEATER SIZE 24

| Depth of Heater | ¼ H. P.—670 R. P. M. 2350 CUBIC FEET OF AIR PER MINUTE | | | | | ⅓ H. P.—850 R. P. M. 3000 CUBIC FEET OF AIR PER MINUTE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Temperature Rise | | B. T. U. Per Hr. | Condensate Per Hr. | Equiv. Sq. Ft. Direct Radiation | Temperature Rise | | B. T. U. Per Hr. | Condensate Per Hr. | Equiv. Sq. Ft. Direct Radiation |
| | From | To | | | | From | To | | | |
| 2 Rows Tubes | 0° | 69° | 162,000 | 169 | 650 | 0° | 62° | 194,000 | 202 | 775 |
| | 30° | 90° | 142,000 | 148 | 568 | 30° | 83° | 169,000 | 176 | 675 |
| | 40° | 97° | 134,000 | 140 | 535 | 40° | 91° | 160,000 | 167 | 640 |
| | 50° | 104° | 127,000 | 132 | 509 | 50° | 98° | 151,800 | 158 | 608 |
| | 60° | 111° | 120,000 | 125 | 480 | 60° | 105° | 143,000 | 149 | 572 |
| | 70° | 118° | 113,000 | 118 | 453 | 70° | 113° | 134,200 | 140 | 537 |
| 3 Rows Tubes | 0° | 97° | 231,000 | 241 | 925 | 0° | 87° | 275,000 | 287 | 1100 |
| | 30° | 114° | 200,000 | 208 | 798 | 30° | 105° | 240,000 | 250 | 960 |
| | 40° | 120° | 190,000 | 198 | 760 | 40° | 111° | 226,000 | 236 | 905 |
| | 50° | 125° | 180,000 | 188 | 722 | 50° | 117° | 215,000 | 224 | 860 |
| | 60° | 131° | 170,000 | 177 | 680 | 60° | 124° | 202,000 | 211 | 808 |
| | 70° | 137° | 159,500 | 166 | 635 | 70° | 130° | 191,000 | 199 | 765 |

Note:—Capacities given above are based on steam at 5 pounds gauge, 227° F. For values at other pressures, multiply capacity given above by constant to be found in percentage curves, page 206.

## Type "H" Modified Unit Heater Size 30



## PHYSICAL DATA

**Fan:**—30" Type "R" Massachusetts Electric Propeller Fan.
**Motor:**—Totally enclosed, automatically lubricated.
**Heater:**—2 Units aerofin 3 rows deep, tubes 3'6" long.

## PERFORMANCE DATA — TYPE H MODIFIED UNIT HEATER SIZE 30

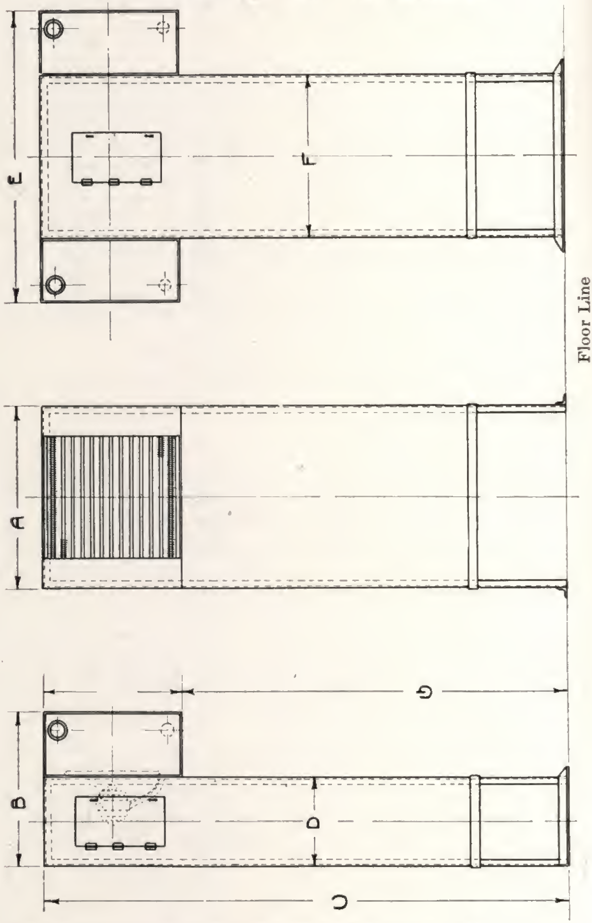
½ H. P.—670 R. P. M.
5400 Cubic Feet of Air Per Minute

| Temperature Rise | | B. T. U. per hour | Condensate per hour | Equiv. Sq. Feet direct radiation |
|---|---|---|---|---|
| From | To | | | |
| 0° | 97° | 537,000 | 560 | 2150 |
| 30° | 114° | 464,000 | 484 | 1852 |
| 40° | 120° | 443,000 | 462 | 1770 |
| 50° | 125° | 418,000 | 436 | 1673 |
| 60° | 131° | 394,500 | 411 | 1580 |
| 70° | 137° | 370,500 | 386 | 1480 |

### NOTE

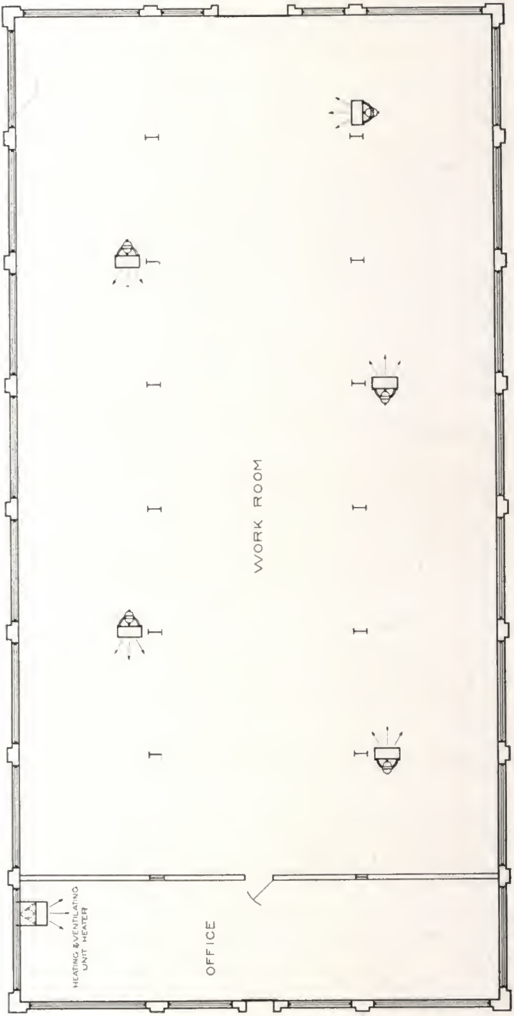
Capacities given are based on steam at 5 pounds gauge, 227° F. For values at other pressures multiply capacity given by constant to be found in percentage curves, page 206.

## Single and Double Recirculating Boxes For Ceiling Type "H" Unit Heaters



| Size | A | B | C | D | E | F | G | H | Shipping Weight |
|---|---|---|---|---|---|---|---|---|---|
| 18″ | 37″ | 31″ | 106″ | 18″ | 58″ | 32″ | 78″ | 28″ | |
| 24″ | 49″ | 31″ | 106″ | 18″ | 58″ | 32″ | 78″ | 28″ | |

## Typical Layout Massachusetts Ceiling Type "H" Unit Heaters.



PLAN OF TYPICAL SMALL MANUFACTURING PLANT HEATED AND VENTILATED BY MASSACHUSETTS TYPE 'H' UNIT HEATER

# Computing Heat Loss

## The B. T. U. Method is the only Accurate Means of Estimating Heat Losses

The B.T.U. method is not so difficult as it may seem and is the only proper way to be followed by all who are interested in obtaining accurate results.

To determine the total heat loss or cooling effect from a room when the room is to be maintained at a certain point in the coldest outside temperature, we find this total heat loss represents the amount of heat that must be supplied by the radiator, and knowing the amount of heat given off by one square foot of radiating surface, it is a simple matter to determine the necessary size of the radiator.

The heat loss from a room is obtained by determining the loss through the exposed walls and glass surfaces and the loss through air leakage, which is known as the number of air changes. This loss is expressed in B.T.U. per hour for one degree of difference in temperature on the two sides of material.

The tables on pages 192, 193, 194, and 195 show factors or co-efficient of B.T.U. loss per square foot of exposed surface per degree difference in temperature.

To obtain the multiplier or factor required, multiply the co-efficient by the temperature difference between the inside and outside of room to be heated.

To the loss through wall and glass must be added the loss through leakage, or air change, as it is usually termed.

To raise the temperature of one cubic foot of air one degree requires .02056 B.T.U.; therefore, the volume of the room times the number of air changes per hour, times .02056, gives the heat loss for each degree difference between the outside and inside temperatures.

The losses through wall, glass and leakage added together give the total B.T.U. loss that must be supplied by radiation.

The character of the surface of the radiation determines its efficiency and from practice we have found that ordinary cast iron radiators will transmit 250 B.T.U. per square foot per hour, while wall radiators and coils will transmit as high as 300 B.T.U. per square foot per hour.

Assuming cast iron radiators are to be used, dividing the 250 B.T.U. into the total B.T.U. loss gives the radiation required in the room.

It is also necessary to take into consideration the exposure of each room and when the amount of radiation required has been figured, the rooms with a north and west exposure generally require an additional 10% of radiation. Rooms heated at long intervals only require as high as 30% additional radiation as compared with rooms heated constantly.

Designing of piping requires experience, care and study, and unless skillfully done will produce questionable results.

Where point of question arises, consult the B&B Engineers.

# Temperature for Estimating Direct Radiation

Heating and Ventilating are the production of artificial climate usually in a well defined confined space, or group of rooms. With surrounding local Climatic conditions understood and considered, it is necessary to know what temperatures are encountered, desirable and otherwise in buildings of various types. There is considerable difference in opinion on this matter but the following tabulation will be found to be representative, usable and not arbitrary in any way.

## Residences

| | |
|---|---|
| Living Rooms | 70° |
| Dining Rooms | 70° |
| Kitchen | 60-65° |
| Bath Rooms | 75-80° |
| Bed Rooms | 70° |
| Play Rooms | 65° |
| Toilets | 60° |
| Vestibules | 60° |
| Halls, Lower | 70° |
| Halls, Upper | 65° |
| Sun Porch | 70° |
| Sewing Room | 75° |
| Billiard Room | 65° |
| Pantry | 60° |

## Commercial & Club Bldgs.

| | |
|---|---|
| Offices, General | 70° |
| Stores, Small | 70° |
| Stores, Large | 65° |
| Work Rooms | 60-65° |
| Garage | 55° |
| Steam Baths | 113° |
| Warm Air Baths | 122° |
| Hot Air Baths | 140° |
| Treatment Rooms | 80° |
| Hot House | 75° |
| Ball Rooms | 65° |

## Hospitals

| | |
|---|---|
| Wards | 75° |
| Private Rooms | 80° |
| Operating Room | 98° |
| Sun Rooms | 70° |
| Reception Rooms | 70° |
| Dressing Rooms | 75° |
| Offices | 70° |
| Bath Rooms | 80° |

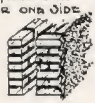
## Schools & Churches

| | |
|---|---|
| Class Rooms | 70° |
| Library | 70° |
| Wardrobe | 60° |
| Manual Training | 65° |
| Laboratories | 68° |
| Offices | 70° |
| Auditorium | 65° |
| Gymnasium | 55° |
| Dressing Rooms | 75° |
| Swimming Pool Room | 75° |
| Toilets | 65° |
| Corridors | 60° |
| Kitchens | 60° |
| Dining Rooms | 65° |

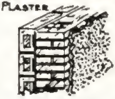
## Miscellaneous

| | |
|---|---|
| Prisons Day Confinement | 65° |
| Prisons Night Confinement | 55° |
| Closed Rooms not Heated but between Heated Rooms | 40° |
| Unheated Vestibules | 23° |
| Unexcavated Space Under Heated Room | 32° |
| Attic Space Beneath Shingle or Slate Roof | 15° |
| Attic Space Beneath Concrete or Composition | 25° |
| Machine Shops | 70° |
| Shops, Stores | 65° |
| Foundries | 50° |

**B. T. U. Transmitted per Square Foot per Hour per Degree Difference in Temperature through various Materials and Types of Exposed Building Construction.**

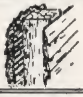
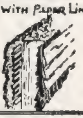
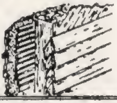
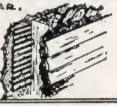
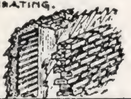
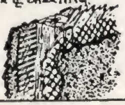
| Kind of Material and Construction | B.T.U. Transmitted per Sq. Ft of Surface | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Thickness of Material | Difference in Temperature | | | | | | | |
| | | 1° | 50° | 55° | 60° | 65° | 70° | 75° | 80° |
| Not Furred or Plastered<br> | 4 in | .59 | 30 | 32 | 35 | 38 | 41 | 44 | 47 |
| | 8½ " | .42 | 21 | 23 | 25 | 27 | 29 | 32 | 34 |
| | 13 " | .32 | 16 | 18 | 19 | 21 | 22 | 24 | 26 |
| | 17½ " | .26 | 13 | 14 | 16 | 17 | 18 | 20 | 21 |
| | 22 " | .22 | 11 | 12 | 13 | 14 | 15 | 17 | 18 |
| | 26½ " | .19 | 10 | 10 | 11 | 12 | 13 | 14 | 15 |
| | 31 " | .16 | 8 | 9 | 10 | 10 | 11 | 12 | 13 |
| Plastered one Side<br> | 4 " | .56 | 28 | 31 | 34 | 36 | 39 | 42 | 45 |
| | 8½ " | .40 | 20 | 22 | 24 | 26 | 28 | 30 | 32 |
| | 13 " | .30 | 15 | 17 | 18 | 20 | 21 | 23 | 24 |
| | 17½ " | .24 | 12 | 13 | 14 | 16 | 17 | 18 | 19 |
| | 22 " | .20 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| | 26½ " | .18 | 9 | 10 | 11 | 12 | 13 | 14 | 14 |
| | 31 " | .15 | 8 | 8 | 9 | 10 | 11 | 11 | 12 |
| Air Space and Plaster one Side<br> | 8½ " | .26 | 13 | 14 | 16 | 17 | 18 | 20 | 21 |
| | 13 " | .22 | 11 | 12 | 13 | 14 | 15 | 17 | 18 |
| | 17½ " | .19 | 10 | 10 | 11 | 12 | 13 | 14 | 15 |
| | 22 " | .16 | 8 | 9 | 10 | 10 | 11 | 12 | 13 |
| | 26½ " | .14 | 7 | 8 | 8 | 9 | 10 | 11 | 11 |
| | 31 " | .12 | 6 | 7 | 7 | 8 | 8 | 9 | 10 |
| Furred and Plastered<br> | 4 " | .34 | 17 | 19 | 20 | 22 | 24 | 26 | 27 |
| | 8½ " | .27 | 14 | 15 | 16 | 18 | 19 | 20 | 22 |
| | 13 " | .22 | 11 | 12 | 13 | 14 | 15 | 17 | 18 |
| | 17½ " | .19 | 10 | 10 | 11 | 12 | 13 | 14 | 15 |
| | 22 " | .16 | 8 | 9 | 10 | 10 | 11 | 12 | 13 |
| | 26½ " | .14 | 7 | 8 | 8 | 9 | 10 | 11 | 11 |
| | 31 " | .12 | 6 | 7 | 7 | 8 | 8 | 9 | 10 |

## B.T.U. Transmitted per Square Foot per Hour per Degree Difference in Temperature through various Materials and Types of Exposed Building Construction.

| Kind of Material and Construction | Thickness of Material | B.T.U. Transmitted per Sq. Ft. of Surface | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Difference in Temperature | | | | | | | |
| | | 1° | 50° | 55° | 60° | 65° | 70° | 75° | 80° |
| Stone and Plaster | 12 in | .48 | 24 | 26 | 29 | 31 | 34 | 36 | 38 |
| | 16 " | .43 | 22 | 24 | 26 | 28 | 30 | 32 | 34 |
| | 20 " | .38 | 19 | 21 | 23 | 25 | 27 | 29 | 30 |
| | 24 " | .35 | 18 | 19 | 21 | 23 | 25 | 26 | 28 |
| | 28 " | .31 | 16 | 17 | 19 | 20 | 22 | 23 | 25 |
| | 32 " | .28 | 14 | 15 | 17 | 18 | 20 | 21 | 22 |
| | 36 " | .25 | 13 | 14 | 15 | 16 | 18 | 19 | 20 |
| Concrete and Plaster | 8 " | .50 | 25 | 28 | 30 | 33 | 35 | 38 | 40 |
| | 12 " | .44 | 22 | 24 | 26 | 29 | 31 | 33 | 35 |
| | 16 " | .37 | 19 | 20 | 22 | 24 | 26 | 28 | 30 |
| | 20 " | .33 | 17 | 18 | 20 | 21 | 23 | 25 | 26 |
| | 24 " | .31 | 16 | 17 | 19 | 20 | 22 | 23 | 25 |
| Brick Facing on Concrete and Plaster | 4 " | .50 | 25 | 28 | 30 | 33 | 35 | 38 | 40 |
| | 8 " | .43 | 22 | 24 | 26 | 28 | 30 | 32 | 34 |
| | 12 " | .39 | 20 | 21 | 23 | 25 | 27 | 29 | 31 |
| | 16 " | .35 | 18 | 19 | 21 | 23 | 25 | 26 | 28 |
| | 20 " | .31 | 16 | 17 | 19 | 20 | 22 | 23 | 25 |
| | 24 " | .27 | 14 | 15 | 16 | 18 | 19 | 20 | 22 |
| Brick Facing on Hollow Tile and Plaster | 4 " | .23 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| | 6 " | .21 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| | 8 " | .18 | 9 | 10 | 11 | 12 | 13 | 14 | 14 |
| | 10 " | .16 | 8 | 9 | 10 | 10 | 11 | 12 | 13 |
| | 12 " | .14 | 7 | 8 | 8 | 9 | 10 | 11 | 11 |
| Terra Cotta Facing on Brick and Plaster  | 4"TC-4"B | .24 | 12 | 13 | 14 | 16 | 17 | 18 | 19 |
| | 4"TC-8"B | .20 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| | 8"TC-8"B | .17 | 9 | 9 | 10 | 11 | 12 | 13 | 14 |
| | 8"TC-12"B | .14 | 7 | 8 | 8 | 9 | 10 | 11 | 11 |
| | 12"TC-8"B | .10 | 5 | 6 | 6 | 7 | 7 | 8 | 8 |

### B.T.U. Transmitted per Square Foot per Hour per Degree Difference in Temperature through various Materials and Types of Exposed Building Construction.

For Walls of Frame Buildings, Lath and Plaster Inside, Outside as Below.

| Kind of Material and Construction | B.T.U. Transmitted per Sq. Ft. of Surface | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Difference in Temperature | | | | | | | |
| | | 1° | 50° | 55° | 60° | 65° | 70° | 75° | 80° |
| Ordinary Overlapping Clap Board Siding.  | | .45 | 23 | 25 | 27 | 29 | 31 | 34 | 36 |
| Same with Paper Lining.  | | .32 | 16 | 18 | 19 | 21 | 22 | 24 | 26 |
| Same with Sheating.  | | .29 | 15 | 16 | 17 | 19 | 20 | 22 | 23 |
| Same with Sheating and Paper.  | | .24 | 12 | 13 | 14 | 16 | 17 | 18 | 19 |
| Brick Veneer and Sheating.  | | .21 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| Stucco, Wire Lath, Air Space & Sheating.  | | .23 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |

### B.T.U. Transmitted per Square Foot per Hour per Degree Difference in Temperature through various Materials and Types of Exposed Building Construction

| KIND OF MATERIAL AND CONSTRUCTION | | B. T. U. Transmitted per Sq. Ft. of Surface | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Difference in Temperature | | | | | | | |
| | | 1° | 50° | 55° | 60° | 65° | 70° | 75° | 80° |
| PORTABLE WALLS | Corrugated Iron on ½" Board | .48 | 24 | 26 | 29 | 31 | 34 | 36 | 38 |
| | " " " 1" " | .38 | 19 | 21 | 23 | 25 | 27 | 29 | 30 |
| | " " " 1½" " | 32 | 16 | 18 | 19 | 21 | 22 | 24 | 26 |
| | " " " 2" " | 27 | 14 | 15 | 16 | 18 | 19 | 20 | 22 |
| | " " " 2½" " | .24 | 12 | 13 | 14 | 16 | 17 | 18 | 19 |
| | " " Only | 1 2 | 60 | 66 | 72 | 78 | 84 | 90 | 96 |
| GLASS | Plate | 74 | 37 | 41 | 44 | 48 | 52 | 56 | 59 |
| | Single | 1.05 | 53 | 52 | 63 | 68 | 74 | 79 | 84 |
| | Double | 49 | 25 | 27 | 29 | 32 | 34 | 37 | 39 |
| | Single Skylight | 1 13 | 57 | 62 | 68 | 73 | 79 | 85 | 90 |
| | Double Skylight | 55 | 28 | 30 | 33 | 36 | 39 | 41 | 44 |
| | Steel Sash Wire Mesh | 1.22 | 61 | 67 | 73 | 79 | 85 | 92 | 98 |
| | Monitor | 1 31 | 66 | 72 | 79 | 85 | 92 | 98 | 105 |
| | Side Walk Prism | 1 45 | 73 | 80 | 87 | 94 | 102 | 109 | 116 |

The amount in square feet of each kind of surface is to be multiplied by its respective constant as shown above, and by the difference in temperature between inside and outside air, The sum of the above B.T.U. gives the loss of heat by exposure. Add to the above as follows:

Ten per cent for northern exposure and where the winds are to be counted on as an important factor.

Ten per cent if heated day time only, and the location of the building is not exposed.

Twenty per cent when the building is heated day time only, and the location of the building is exposed.

Thirty per cent when the building is heated during winter months intermittently with long intervals of non-heating.

With glass and skylight it is desirable to consider single thickness in all cases, owing to the fact that the single thickness may be substituted by the building contractor without the knowledge of the owner, or it may be substituted by the owner to save cost, or even if double thick be installed at first, it may in time become broken and be replaced with single-thickness glass.

# B.T.U. Required for Heating Air

**The B.T.U. required for heating air. Multiply the cubical contents of the room in question by the factor given in this table, the result being the B.T.U. loss and which must be supplied by the radiators.**

| External Temp. Deg. Fahr | TEMPERATURE OF AIR IN ROOM | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 |
| —40 | 1 802 | 2 027 | 2 252 | 2 479 | 2 703 | 2 928 | 3 154 | 3 379 | 3 604 | 3 829 |
| —30 | 1 540 | 1 760 | 1 980 | 2 200 | 2 420 | 2 640 | 2 860 | 3 080 | 3 300 | 3 520 |
| —20 | 1 290 | 1 505 | 1 720 | 1 935 | 2 150 | 2 365 | 2 580 | 2 795 | 3 010 | 3 225 |
| —10 | 1 051 | 1 262 | 1 473 | 1 684 | 1 892 | 2 102 | 2 311 | 2 522 | 2 732 | 2 943 |
| 0 | 822 | 1 028 | 1 234 | 1 439 | 1 645 | 1 851 | 2 056 | 2 262 | 2 467 | 2 673 |
| 10 | 604 | 805 | 1 007 | 1 208 | 1 409 | 1 611 | 1 812 | 2 013 | 2 215 | 2 416 |
| 20 | 393 | 590 | 787 | 984 | 1 181 | 1 378 | 1 575 | 1 771 | 1 968 | 2 165 |
| 30 | 192 | 385 | 578 | 770 | 963 | 1 155 | 1 345 | 1 540 | 1 735 | 1 925 |
| 40 | | 188 | 376 | 564 | 752 | 940 | 1 128 | 1 316 | 1 504 | 1 692 |
| 50 | | | 184 | 367 | 551 | 735 | 918 | 1 102 | 1 286 | 1 470 |
| 60 | | | | 179 | 359 | 538 | 718 | 897 | 1 077 | 1 256 |
| 70 | | | | | 175 | 350 | 525 | 700 | 875 | 1 049 |

# Wrought Iron Welded Steam, Gas, and Water Pipe

TABLE OF STANDARD DIMENSIONS

| Diameter | | | Thickness | Circumference | | Transverse Areas | | | Length of Pipe per Sq. Ft. of | | Length of Pipe Containing One Cu. Ft. | Nominal Weight per Foot | No. of Threads per Inch of Screw | Tap Drill |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal Internal | Actual External | Actual Internal | | External | Internal | External | Internal | Metal | External Surface | Internal Surface | | | | |
| Inches | Inches | Inches | Inches | Inches | Inches | Sq. In. | Sq. In. | Sq. In. | Feet | Feet | Feet | Lbs. | | |
| ⅛ | 0.405 | 0.27 | 0.068 | 1.272 | 0.848 | 0.129 | 0.0573 | 0.0717 | 9.44 | 14.15 | 2513. | 0.241 | 27 | 11/32 |
| ¼ | 0.54 | 0.364 | 0.088 | 1.696 | 1.144 | 0.229 | 0.1041 | 0.1249 | 7.075 | 10.49 | 1383.3 | 0.42 | 18 | 7/16 |
| ⅜ | 0.675 | 0.494 | 0.091 | 2.121 | 1.552 | 0.358 | 0.1917 | 0.1663 | 5.657 | 7.73 | 751.2 | 0.559 | 18 | 19/32 |
| ½ | 0.84 | 0.623 | 0.109 | 2.639 | 1.957 | 0.554 | 0.3048 | 0.2492 | 4.547 | 6.13 | 472.4 | 0.837 | 14 | 23/32 |
| ¾ | 1.05 | 0.824 | 0.113 | 3.299 | 2.589 | 0.866 | 0.5333 | 0.3327 | 3.637 | 4.635 | 270. | 1.115 | 14 | 15/16 |
| 1 | 1.315 | 1.048 | 0.134 | 4.131 | 3.292 | 1.358 | 0.8626 | 0.4954 | 2.904 | 3.645 | 166.9 | 1.668 | 11½ | 1 3/16 |
| 1¼ | 1.66 | 1.38 | 0.14 | 5.215 | 4.335 | 2.164 | 1.496 | 0.668 | 2.301 | 2.768 | 96.25 | 2.244 | 11½ | 1½ |
| 1½ | 1.9 | 1.611 | 0.145 | 5.969 | 5.061 | 2.835 | 2.038 | 0.797 | 2.01 | 2.371 | 70.66 | 2.678 | 11½ | 1¾ |
| 2 | 2.375 | 2.067 | 0.154 | 7.461 | 6.494 | 4.43 | 3.356 | 1.074 | 1.608 | 1.848 | 42.91 | 3.609 | 11½ | 2¼ |
| 2½ | 2.875 | 2.468 | 0.204 | 9.032 | 7.753 | 6.492 | 4.784 | 1.708 | 1.328 | 1.547 | 30.1 | 5.739 | 8 | 2 11/16 |
| 3 | 3.5 | 3.067 | 0.217 | 10.996 | 9.636 | 9.621 | 7.388 | 2.243 | 1.091 | 1.245 | 19.5 | 7.536 | 8 | 3 5/16 |
| 3½ | 4. | 3.548 | 0.226 | 12.566 | 11.146 | 12.566 | 9.887 | 2.679 | 0.955 | 1.077 | 14.57 | 9.001 | 8 | 3 13/16 |
| 4 | 4.5 | 4.026 | 0.237 | 14.137 | 12.648 | 15.904 | 12.73 | 3.174 | 0.849 | 0.949 | 11.31 | 10.665 | 8 | 4 5/16 |
| 4½ | 5. | 4.508 | 0.246 | 15.708 | 14.162 | 19.635 | 15.961 | 3.674 | 0.764 | 0.848 | 9.02 | 12.34 | 8 | ... |
| 5 | 5.563 | 5.045 | 0.259 | 17.477 | 15.849 | 24.306 | 19.99 | 4.316 | 0.687 | 0.757 | 7.2 | 14.502 | 8 | ... |
| 6 | 6.625 | 6.065 | 0.28 | 20.813 | 19.054 | 34.472 | 28.888 | 5.584 | 0.577 | 0.63 | 4.98 | 18.762 | 8 | ... |
| 7 | 7.625 | 7.023 | 0.301 | 23.955 | 22.063 | 45.664 | 38.738 | 6.926 | 0.501 | 0.544 | 3.72 | 23.271 | 8 | ... |
| 8 | 8.625 | 7.982 | 0.322 | 27.096 | 25.076 | 58.426 | 50.04 | 8.386 | 0.443 | 0.478 | 2.88 | 28.177 | 8 | ... |
| 9 | 9.625 | 8.937 | 0.344 | 30.238 | 28.076 | 72.76 | 62.73 | 10.03 | 0.397 | 0.427 | 2.29 | 33.701 | 8 | ... |
| 10 | 10.75 | 10.019 | 0.366 | 33.772 | 31.477 | 90.763 | 78.839 | 11.924 | 0.355 | 0.382 | 1.82 | 40.065 | 8 | ... |

### SQUARE FEET OF SURFACE PER LINEAL FOOT OF PIPE

ON ALL LENGTHS OVER 1 FT.; FRACTIONS LESS THAN TENTHS ARE ADDED TO OR DROPPED

SIZE OF PIPE

| Length of Pipe | ¾ | 1 | 1¼ | 1½ | 2 | 2½ | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .275 | .346 | .434 | .494 | .622 | .753 | .916 | 1.175 | 1.455 | 1.739 | 1.996 | 2.257 |
| 2 | .5 | .7 | .9 | 1. | 1.2 | 1.5 | 1.8 | 2.4 | 2.9 | 3.5 | 4. | 4.5 |
| 3 | .8 | 1. | 1.3 | 1.5 | 1.9 | 2.3 | 2.7 | 3.5 | 4.4 | 5.2 | 6. | 6.8 |
| 4 | 1.1 | 1.4 | 1.7 | 2. | 2.5 | 3. | 3.6 | 4.7 | 5.8 | 7. | 8. | 9. |
| 5 | 1.4 | 1.7 | 2.2 | 2.4 | 3.1 | 3.8 | 4.6 | 5.8 | 7.3 | 7.7 | 10. | 11.3 |
| 6 | 1.6 | 2.1 | 2.6 | 2.9 | 3.7 | 4.5 | 5.5 | 7. | 8.7 | 10.5 | 12. | 13.5 |
| 7 | 1.9 | 2.4 | 3. | 3.4 | 4.4 | 5.3 | 6.4 | 8.2 | 10.2 | 12.1 | 14. | 15.8 |
| 8 | 2.2 | 2.8 | 3.5 | 3.9 | 5. | 6. | 7.3 | 9.4 | 11.6 | 13.9 | 16. | 18. |
| 9 | 2.5 | 3.1 | 3.9 | 4.4 | 5.6 | 6.8 | 8.2 | 10.6 | 13.1 | 15.7 | 18. | 20.3 |
| 10 | 2.7 | 3.5 | 4.3 | 4.9 | 6.2 | 7.5 | 9.1 | 11.8 | 14.6 | 17.4 | 20. | 22.6 |
| 11 | 3. | 3.8 | 4.8 | 5.4 | 6.8 | 8.3 | 10. | 12.9 | 16. | 19.1 | 22. | 24.9 |
| 12 | 3.3 | 4.1 | 5.2 | 5.9 | 7.5 | 9. | 11. | 14.1 | 17.4 | 20.9 | 24. | 27.1 |
| 13 | 3.6 | 4.5 | 5.6 | 6.4 | 8.1 | 9.8 | 11.9 | 15.3 | 18.9 | 22.6 | 26. | 29.4 |
| 14 | 3.8 | 4.8 | 6.1 | 6.9 | 8.7 | 10.5 | 12.8 | 16.5 | 20.3 | 24.3 | 28. | 31.6 |
| 15 | 4.1 | 5.2 | 6.5 | 7.4 | 9.3 | 11.3 | 13.7 | 17.6 | 21.8 | 26.1 | 30. | 33.9 |
| 16 | 4.4 | 5.5 | 6.9 | 7.9 | 10. | 12. | 14.6 | 18.8 | 23.2 | 27.8 | 32. | 36.1 |
| 17 | 4.7 | 5.9 | 7.4 | 8.4 | 10.6 | 12.8 | 15.5 | 20. | 24.7 | 29.5 | 34. | 38.4 |
| 18 | 5. | 6.2 | 7.8 | 8.9 | 11.2 | 13.5 | 16.5 | 21.2 | 26.2 | 31.3 | 36. | 40.6 |
| 19 | 5.2 | 6.6 | 8.3 | 9.4 | 11.8 | 14.3 | 17.4 | 22.3 | 27.6 | 33.1 | 38. | 42.9 |
| 20 | 5.5 | 6.9 | 8.7 | 9.9 | 12.5 | 15. | 18.3 | 23.5 | 29.1 | 34.8 | 40. | 45.2 |
| 21 | 5.8 | 7.3 | 9.1 | 10.4 | 13. | 15.8 | 19.2 | 24.7 | 30.5 | 36.5 | 42. | 47.4 |
| 22 | 6. | 7.6 | 9.6 | 10.9 | 13.7 | 16.5 | 20.2 | 25.9 | 32. | 38.3 | 44. | 49.7 |
| 23 | 6.3 | 8. | 10. | 11.3 | 14.3 | 17.3 | 21.1 | 27. | 33.5 | 40. | 46. | 52. |
| 24 | 6.6 | 8.3 | 10.4 | 11.9 | 14.9 | 18. | 22. | 28.2 | 34.9 | 41.7 | 48. | 54.2 |
| 25 | 6.9 | 8.6 | 10.9 | 12.3 | 15.6 | 18.8 | 22.9 | 29.3 | 36.3 | 43.5 | 50. | 56.4 |
| 26 | 7.1 | 9. | 11.3 | 12.8 | 16.2 | 19.5 | 23.8 | 30.5 | 37.8 | 45.2 | 52. | 58.6 |
| 27 | 7.4 | 9.4 | 11.7 | 13.3 | 16.8 | 20.3 | 24.7 | 31.7 | 39.3 | 47. | 54. | 61. |
| 28 | 7.7 | 9.7 | 12.2 | 13.8 | 17.4 | 21. | 25.6 | 32.9 | 40.7 | 48.7 | 56. | 63.2 |
| 29 | 8. | 10. | 12.6 | 14.3 | 18. | 21.8 | 26.6 | 34.1 | 42.2 | 50.4 | 58. | 65.5 |
| 30 | 8.3 | 10.4 | 13. | 14.8 | 18.7 | 22.5 | 27.5 | 35.3 | 43.6 | 52.1 | 60. | 67.7 |
| 31 | 8.5 | 10.7 | 13.5 | 15.3 | 19.3 | 23.3 | 28.4 | 36.4 | 45.1 | 53.9 | 62. | 70. |
| 32 | 8.8 | 11.1 | 13.9 | 15.8 | 19.9 | 24.1 | 29.3 | 37.6 | 46.5 | 55.6 | 64. | 72.2 |
| 33 | 9.1 | 11.4 | 14.3 | 16.3 | 20.5 | 24.8 | 30.2 | 38.8 | 48. | 57.4 | 66. | 74.4 |
| 34 | 9.4 | 11.7 | 14.7 | 16.8 | 21.2 | 25.6 | 31.1 | 40. | 49.5 | 59.1 | 68. | 76.7 |
| 35 | 9.6 | 12.1 | 15.2 | 17.3 | 21.8 | 26.3 | 32. | 41.1 | 50.9 | 60.8 | 70. | 79. |
| 36 | 9.9 | 12.5 | 15.6 | 17.8 | 22.4 | 27. | 33. | 42.3 | 52.4 | 62.6 | 72. | 81.3 |
| 37 | 10.2 | 12.8 | 16.1 | 18.3 | 23. | 27.8 | 33.9 | 43.5 | 53.8 | 64.3 | 74. | 83.5 |
| 38 | 10.5 | 13.2 | 16.5 | 18.8 | 23.7 | 28.5 | 34.8 | 44.6 | 55.2 | 66. | 76. | 85.8 |
| 39 | 10.7 | 13.5 | 16.9 | 19.3 | 24.3 | 29.3 | 35.7 | 45.8 | 56.7 | 67.8 | 78. | 88. |
| 40 | 11. | 13.8 | 17.4 | 19.8 | 24.9 | 30.1 | 36.6 | 47. | 58.2 | 69.5 | 80. | 90.2 |
| 41 | 11.3 | 14.2 | 17.8 | 20.3 | 25.5 | 30.8 | 37.6 | 48.2 | 59.6 | 71.3 | 82. | 92.5 |
| 42 | 11.5 | 14.5 | 18.2 | 20.8 | 26.1 | 31.6 | 38.5 | 49.4 | 61.1 | 73. | 84. | 94.8 |
| 43 | 11.8 | 14.9 | 18.7 | 21.3 | 26.8 | 32.3 | 39.4 | 50.6 | 62.5 | 74.8 | 86. | 97. |
| 44 | 12.1 | 15.2 | 19.1 | 21.8 | 27.4 | 33.1 | 40.3 | 51.7 | 64. | 76.5 | 88. | 99.3 |
| 45 | 12.4 | 15.6 | 19.5 | 22.2 | 28. | 33.8 | 41.2 | 52.9 | 65.5 | 78.2 | 90. | 101.6 |
| 46 | 12.7 | 15.9 | 20. | 22.7 | 28.6 | 34.6 | 42.2 | 54. | 67. | 80. | 92. | 103.8 |
| 47 | 12.9 | 16.3 | 20.4 | 23.2 | 29.2 | 35.3 | 43. | 55.2 | 68.4 | 81.7 | 94. | 106. |
| 48 | 13.2 | 16.6 | 20.8 | 23.7 | 29.9 | 36.1 | 43.9 | 56.4 | 69.8 | 83.5 | 96. | 108.4 |
| 49 | 13.5 | 17. | 21.3 | 24.2 | 30.5 | 36.8 | 44.8 | 57.6 | 71.2 | 85.1 | 98. | 110.5 |
| 50 | 13.8 | 17.3 | 21.7 | 24.7 | 31.1 | 37.6 | 45.8 | 58.7 | 72.7 | 87. | 100. | 112.8 |

### TABLE SHOWING EXPANSION OF WROUGHT IRON PIPE

| Initial | Increase in Length per 100 Ft. when Heated to | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Temperature | 160° | 180° | 200° | 212° | 228° | 240° | 250° | 259° | 267° | 274° |
| Zero, in. | 1.28 | 1.44 | 1.60 | 1.69 | 1.82 | 1.92 | 2.00 | 2.07 | 2.13 | 2.20 |
| 32° in. | 1.02 | 1.18 | 1.34 | 1.43 | 1.56 | 1.66 | 1.74 | 1.81 | 1.87 | 1.94 |
| 64° in. | 0.77 | 0.93 | 1.09 | 1.18 | 1.31 | 1.41 | 1.49 | 1.56 | 1.61 | 1.69 |
| | Hot Water | | | Water Boils | 5 lb. | 10 lb. | 15 lb. | 20 lb. | 25 lb. | 30 lb. |

Wrought iron pipe expands, in inches, per 100 ft., 4/5 of the increase in temperature of steam or water it is subjected to, over the temperature at the time of installation, divided by 100.

Example—Temperature when installed, 32°, 10 lb. pressure=240°, difference 208°, 4/5 of which equals 1.66 in. expansion per 100 ft.

## Heating Surface—Square Feet Standard Cast Iron Direct Radiation

| No. of Sect-ions. | Length 2½" per Sect. | SINGLE COLUMN. | | | | | TWO COLUMN. | | | | | THREE COLUMN. | | | | | FOUR COLUMN. | | | | | WINDOW. | | Length 2½" per Section | No. of Sect-ions. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 38" 3ϕ Sec | 32" 2½ϕ Sec | 26" 2ϕ Sec | 23" 1⅔ϕ Sec | 20" 1½ϕ Sec | 38" 4ϕ Sec. | 32" 3⅓ϕ Sec. | 26" 2⅔ϕ Sec | 23" 2⅓ϕ Sec | 20" 2ϕ Sec | 38" 5ϕ Sec | 32" 4½ϕ Sec | 26" 3¾ϕ Sec | 22" 3ϕ Sec. | 18" 2¼ϕ Sec | 38" 8ϕ Sec | 32" 6½ϕ Sec | 26" 5ϕ Sec | 22" 4ϕ Sec. | 18" 3ϕ Sec. | 28" 4¾ϕ Sec | 24" 4ϕ Sec. | | |
| 2 | 5 | 6 | 5 | 4 | 3⅓ | 3 | 8 | 6⅔ | 5⅓ | 4⅔ | 4 | 10 | 9 | 7½ | 6 | 4½ | 16 | 13 | 10 | 8 | 6 | 9½ | 8 | 5 | 2 |
| 3 | 7½ | 9 | 7½ | 6 | 5 | 4½ | 12 | 10 | 8 | 7 | 6 | 15 | 13½ | 11¼ | 9 | 6¾ | 24 | 19½ | 15 | 12 | 9 | 14¼ | 12 | 7½ | 3 |
| 4 | 10 | 12 | 10 | 8 | 6⅔ | 6 | 16 | 13⅓ | 10⅔ | 9⅓ | 8 | 20 | 18 | 15 | 12 | 9 | 32 | 26 | 20 | 16 | 12 | 19 | 16 | 10 | 4 |
| 5 | 12½ | 15 | 12½ | 10 | 8⅓ | 7½ | 20 | 16⅔ | 13⅓ | 11⅔ | 10 | 25 | 22½ | 18¾ | 15 | 11¼ | 40 | 32½ | 25 | 20 | 15 | 23¾ | 20 | 12½ | 5 |
| 6 | 15 | 18 | 15 | 12 | 10 | 9 | 24 | 20 | 16 | 14 | 12 | 30 | 27 | 22½ | 18 | 13½ | 48 | 39 | 30 | 24 | 18 | 28½ | 24 | 15 | 6 |
| 7 | 17½ | 21 | 17½ | 14 | 11⅔ | 10½ | 28 | 23⅓ | 18⅔ | 16⅓ | 14 | 35 | 31½ | 26¼ | 21 | 15¾ | 56 | 45½ | 35 | 28 | 21 | 33¼ | 28 | 17½ | 7 |
| 8 | 20 | 24 | 20 | 16 | 13⅓ | 12 | 32 | 26⅔ | 21⅓ | 18⅔ | 16 | 40 | 36 | 30 | 24 | 18 | 64 | 52 | 40 | 32 | 24 | 38 | 32 | 20 | 8 |
| 9 | 22½ | 27 | 22½ | 18 | 15 | 13½ | 36 | 30 | 24 | 21 | 18 | 45 | 40½ | 33¾ | 27 | 20¼ | 72 | 58½ | 45 | 36 | 27 | 42¾ | 36 | 22½ | 9 |
| 10 | 25 | 30 | 25 | 20 | 16⅔ | 15 | 40 | 33⅓ | 26⅔ | 23⅓ | 20 | 50 | 45 | 37½ | 30 | 22½ | 80 | 65 | 50 | 40 | 30 | 47½ | 40 | 25 | 10 |
| 11 | 27½ | 33 | 27½ | 22 | 18⅓ | 16½ | 44 | 36⅔ | 29⅓ | 25⅔ | 22 | 55 | 49½ | 41¼ | 33 | 24¾ | 88 | 71½ | 55 | 44 | 33 | 52¼ | 44 | 27½ | 11 |
| 12 | 30 | 36 | 30 | 24 | 20 | 18 | 48 | 40 | 32 | 28 | 24 | 60 | 54 | 45 | 36 | 27 | 96 | 78 | 60 | 48 | 36 | 57 | 48 | 30 | 12 |
| 13 | 32½ | 39 | 32½ | 26 | 21⅔ | 19½ | 52 | 43⅓ | 34⅔ | 30⅓ | 26 | 65 | 58½ | 48¾ | 39 | 29¼ | 104 | 84½ | 65 | 52 | 39 | 61¾ | 52 | 32½ | 13 |
| 14 | 35 | 42 | 35 | 28 | 23⅓ | 21 | 56 | 46⅔ | 37⅓ | 32⅔ | 28 | 70 | 63 | 52½ | 42 | 31½ | 112 | 91 | 70 | 56 | 42 | 66½ | 56 | 35 | 14 |
| 15 | 37½ | 45 | 37½ | 30 | 25 | 22½ | 60 | 50 | 40 | 35 | 30 | 75 | 67½ | 56¼ | 45 | 33¾ | 120 | 97½ | 75 | 60 | 45 | 71¼ | 60 | 37½ | 15 |
| 16 | 40 | 48 | 40 | 32 | 26⅔ | 24 | 64 | 53⅓ | 42⅔ | 37⅓ | 32 | 80 | 72 | 60 | 48 | 36 | 128 | 104 | 80 | 64 | 48 | 76 | 64 | 40 | 16 |
| 17 | 42½ | 51 | 42½ | 34 | 28⅓ | 25½ | 68 | 56⅔ | 45⅓ | 39⅔ | 34 | 85 | 76½ | 63¾ | 51 | 38¼ | 136 | 110½ | 85 | 68 | 51 | 80¾ | 68 | 42½ | 17 |
| 18 | 45 | 54 | 45 | 36 | 30 | 27 | 72 | 60 | 48 | 42 | 36 | 90 | 81 | 67½ | 54 | 40½ | 144 | 117 | 90 | 72 | 54 | 85½ | 72 | 45 | 18 |
| 19 | 47½ | 57 | 47½ | 38 | 31⅔ | 28½ | 76 | 63⅓ | 50⅔ | 44⅓ | 38 | 95 | 85½ | 71¼ | 57 | 42¾ | 152 | 123½ | 95 | 76 | 57 | 90¼ | 76 | 47½ | 19 |
| 20 | 50 | 60 | 50 | 40 | 33⅓ | 30 | 80 | 66⅔ | 53⅓ | 46⅔ | 40 | 100 | 90 | 75 | 60 | 45 | 160 | 130 | 100 | 80 | 60 | 95 | 80 | 50 | 20 |
| 21 | 52½ | 63 | 52½ | 42 | 35 | 31½ | 84 | 70 | 56 | 49 | 42 | 105 | 94½ | 78¾ | 63 | 47¼ | 168 | 136½ | 105 | 84 | 63 | | | | 21 |
| 22 | 55 | 66 | 55 | 44 | 36⅔ | 33 | 88 | 73⅓ | 58⅔ | 51⅓ | 44 | 110 | 99 | 82½ | 66 | 49½ | 176 | 143 | 110 | 88 | 66 | | | | 22 |
| 23 | 57½ | 69 | 57½ | 46 | 38⅓ | 34½ | 92 | 76⅔ | 61⅓ | 53⅔ | 46 | 115 | 103½ | 86¼ | 69 | 51¾ | 184 | 149½ | 115 | 92 | 69 | | | | 23 |
| 24 | 60 | 72 | 60 | 48 | 40 | 36 | 96 | 80 | 64 | 56 | 48 | 120 | 108 | 90 | 72 | 54 | 192 | 156 | 120 | 96 | 72 | | | | 24 |
| 25 | 62½ | 75 | 62½ | 50 | 41⅔ | 37½ | 100 | 83⅓ | 66⅔ | 58⅓ | 50 | 125 | 112½ | 93¾ | 75 | 56¼ | 200 | 162½ | 125 | 100 | 75 | | | | 25 |
| 26 | 65 | 78 | 65 | 52 | 43⅓ | 39 | 104 | 86⅔ | 69⅓ | 60⅔ | 52 | 130 | 117 | 97½ | 78 | 58½ | 208 | 169 | 130 | 104 | 78 | | | | 26 |

# PROPERTIES OF SATURATED STEAM

| Vacuum in ins. of Mercury or Gage Pres. in lbs. | Absolute Pressure in lbs. per sq. in. | Temperature in Deg. fahr | Total Heat above 32° fahr. | | Latent Heat of the Steam in B.t.u. | Volume in cu. ft. of 1 lb. of Steam |
|---|---|---|---|---|---|---|
| | | | B.t.u. in the Water | B.t.u. in the Steam | | |
| 27.88 | 1. | 101.83 | 69.8 | 1104.4 | 1034.6 | 333.0 |
| 25.85 | 2. | 126.15 | 94.0 | 1115.0 | 1021.0 | 173.5 |
| 23.81 | 3. | 141.52 | 109.4 | 1121.6 | 1012.3 | 118.5 |
| 21.78 | 4. | 153.01 | 120.9 | 1126.5 | 1005.7 | 90.5 |
| 19.74 | 5. | 162.28 | 130.1 | 1130.5 | 1000.3 | 73.33 |
| 17.70 | 6. | 170.06 | 137.9 | 1133.7 | 995.8 | 61.89 |
| 15.67 | 7. | 176.85 | 144.7 | 1136.5 | 991.8 | 53.56 |
| 13.63 | 8. | 182.86 | 150.8 | 1139.0 | 988.2 | 47.27 |
| 11.60 | 9. | 188.27 | 156.2 | 1141.1 | 985.0 | 42.36 |
| 9.56 | 10. | 193.22 | 161.1 | 1143.1 | 982.0 | 38.38 |
| 7.52 | 11. | 197.75 | 165.7 | 1144.9 | 979.2 | 35.10 |
| 5.49 | 12. | 201.96 | 169.9 | 1146.5 | 976.6 | 32.36 |
| 3.45 | 13. | 205.87 | 173.8 | 1148.0 | 974.2 | 30.03 |
| 1.42 | 14. | 209.55 | 177.5 | 1149.4 | 971.9 | 28.02 |
| 0.00 | 14.70 | 212.00 | 180.0 | 1150.4 | 970.4 | 26.79 |
| 0.3 | 15. | 213.00 | 181.0 | 1150.7 | 969.7 | 26.27 |
| 1.3 | 16. | 216.3 | 184.4 | 1152.0 | 967.6 | 24.79 |
| 2.3 | 17. | 219.4 | 187.5 | 1153.1 | 965.6 | 23.38 |
| 3.3 | 18. | 222.4 | 190.5 | 1154.2 | 963.7 | 22.16 |
| 4.3 | 19. | 225.2 | 193.4 | 1155.2 | 961.8 | 21.07 |
| 5.3 | 20. | 228.0 | 196.1 | 1156.2 | 960.0 | 20.08 |
| 6.3 | 21. | 230.6 | 198.8 | 1157.1 | 958.3 | 19.18 |
| 7.3 | 22. | 233.1 | 201.3 | 1158.0 | 956.7 | 18.37 |
| 8.3 | 23. | 235.5 | 203.8 | 1158.8 | 955.1 | 17.62 |
| 9.3 | 24. | 237.8 | 206.1 | 1159.6 | 953.5 | 16.93 |
| 10.3 | 25. | 240.1 | 208.4 | 1160.4 | 952.0 | 16.30 |
| 15.3 | 30. | 250.3 | 218.8 | 1163.9 | 945.1 | 13.74 |
| 20.3 | 35. | 259.3 | 227.3 | 1166.8 | 938.9 | 11.89 |
| 25.3 | 40. | 267.3 | 236.1 | 1169.4 | 933.3 | 10.49 |
| 31.3 | 46. | 275.8 | 244.8 | 1172.0 | 927.2 | 9.20 |
| 35.3 | 50. | 281.0 | 250.1 | 1173.6 | 923.5 | 8.51 |
| 41.3 | 56. | 288.2 | 257.5 | 1175.7 | 918.2 | 7.65 |
| 45.3 | 60. | 292.7 | 262.1 | 1177.0 | 914.9 | 7.17 |
| 51.3 | 66. | 299.0 | 268.5 | 1178.8 | 910.2 | 6.56 |
| 61.3 | 76. | 308.5 | 278.3 | 1181.4 | 903.0 | 5.74 |
| 71.3 | 86. | 317.1 | 287.2 | 1183.6 | 896.4 | 5.10 |
| 81.3 | 96. | 324.9 | 295.3 | 1185.6 | 890.3 | 4.60 |
| 90.3 | 105 | 331.4 | 302.0 | 1187.2 | 885.2 | 4.23 |
| 100.3 | 115. | 338.1 | 309.0 | 1188.8 | 879.8 | 3.88 |
| 125.3 | 140. | 353.1 | 324.6 | 1192.2 | 867.6 | 3.219 |
| 140.3 | 155. | 361.1 | 332.9 | 1194.0 | 861.0 | 2.920 |
| 150.3 | 165. | 366.1 | 338.2 | 1195.0 | 856.8 | 2.753 |
| 165.3 | 180. | 373.1 | 345.6 | 1196.4 | 850.8 | 2.533 |
| 175.3 | 190. | 377.6 | 350.4 | 1197.3 | 846.9 | 2.406 |
| 200.3 | 215. | 388.0 | 361.4 | 1199.2 | 837.9 | 2.138 |

# Flow of Steam in Pipes

| Pressure Drop in Ounces | $87\sqrt{\frac{\text{Drop}}{100}}$ | Inside Dia. Pipe Inches | $\sqrt{\frac{D^5}{1+\frac{3.6}{D}}}$ | Steam Pressure | $\sqrt{\text{Density}}$ | Length Pipe in Inches | $\sqrt{\frac{100}{\text{Length}}}$ |
|---|---|---|---|---|---|---|---|
| 1 | 2.175 | 1 | .522 | 0 | .193 | 20 | 2.240 |
| 2 | 3.076 | 1¼ | 1.177 | .3 | .195 | 40 | 1.580 |
| 3 | 3.767 | 1½ | 1.828 | 1.3 | .201 | 60 | 1.290 |
| 4 | 4.350 | 2 | 3.709 | 2.3 | .207 | 80 | 1.120 |
| 5 | 4.863 | 2½ | 6.109 | 5.3 | .223 | 100 | 1.000 |
| 6 | 5.328 | 3 | 11.183 | 10.3 | .248 | 120 | .912 |
| 7 | 5.754 | 3½ | 16.705 | 15.3 | .270 | 140 | .841 |
| 8 | 6.152 | 4 | 23.630 | 20.3 | .290 | 160 | .793 |
| 10 | 6.878 | 4½ | 32.098 | 30.3 | .326 | 180 | .741 |
| 12 | 7.534 | 5 | 43.719 | 40.3 | .358 | 200 | .710 |
| 14 | 8.138 | 6 | 69.718 | 50.3 | .388 | 250 | .632 |
| 16 | 8.700 | 7 | 105.35 | 60.3 | .415 | 300 | .578 |
| 20 | 9.727 | 8 | 150.33 | 75.3 | .452 | 350 | .538 |
| 24 | 10.655 | 9 | 205.37 | 100.3 | .507 | 400 | .500 |
| 28 | 11.509 | 10 | 271.16 | 125.3 | .557 | 450 | .477 |
| 32 | 12.290 | 12 | 437.51 | 150.3 | .603 | 500 | .447 |
| 40 | 13.756 | 14 | 733.90 | 175.3 | .645 | 600 | .407 |
| 48 | 15.069 | 16 | 925.19 | 200.3 | .648 | 700 | .378 |
| 80 | 19.454 | | | | | 800 | .354 |
| 160 | 27.512 | | | | | 900 | .333 |
| 320 | 38.863 | | | | | 1000 | .316 |
| 480 | 47.652 | | | | | 1400 | .267 |

A×B×C×D = lbs. steam per minute will flow through a pipe for a given condition. Example 4.35×11.183×223×1.00 = 10.84 lbs. per minute—10.84×60 = 650.4 lbs. per hour.

p = Drop in pressure in lbs.
d = inside dia. pipe in inches
L = Length of pipe in feet
D = Density of steam per cu.ft.
W = lbs. of steam per minute

$$W = \sqrt{\frac{PDd^5}{\left(1+\frac{3.6}{d}\right) L}}$$

$$P = .000131\left(1+\frac{3.6}{d}\right)\frac{W^2L}{Dd^5}$$

# Chimney Capacities in Horse Power

Horse Power $= 3.33(A - 0.6\sqrt{A})\sqrt{H}$

| Diam in Inches | Area-A in Sq. Ft. | Effective Area $E = A - .6\sqrt{A}$ Sq. Ft. | Height of Chimney in Feet: 50 | 60 | 70 | 80 | 90 | 100 | 110 | 125 | 150 | 175 | 200 | 225 | 250 | 300 | Equiv. Sq. Chimney Side of Sq. $\sqrt{E} + 4''$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Commercial Horse Power of Boiler | | | | | | | | | | | | | | |
| 18 | 1.77 | 0.97 | 23 | 25 | 27 | 29 | | | | | | | | | | | 16 |
| 21 | 2.41 | 1.47 | 35 | 38 | 41 | 44 | | | | | | | | | | | 19 |
| 24 | 3.14 | 2.08 | 49 | 54 | 58 | 62 | 66 | | | | | | | | | | 22 |
| 27 | 3.98 | 2.78 | 65 | 72 | 78 | 83 | 88 | | | | | | | | | | 24 |
| 30 | 4.91 | 3.58 | 84 | 92 | 100 | 107 | 113 | 119 | | | | | | | | | 27 |
| 33 | 5.94 | 4.48 | 115 | 115 | 125 | 133 | 141 | 149 | 156 | | | | | | | | 30 |
| 36 | 7.07 | 5.47 | | 141 | 152 | 163 | 173 | 182 | 191 | 204 | | | | | | | 32 |
| 39 | 8.30 | 6.57 | | | 183 | 196 | 208 | 219 | 229 | 245 | 268 | | | | | | 35 |
| 42 | 9.62 | 7.76 | | | 216 | 231 | 245 | 258 | 271 | 289 | 316 | 342 | | | | | 38 |
| 48 | 12.57 | 10.44 | | | | 311 | 330 | 348 | 365 | 389 | 426 | 460 | 492 | | | | 43 |
| 54 | 15.90 | 13.51 | | | | | 427 | 449 | 472 | 503 | 551 | 595 | 636 | 675 | | | 48 |
| 60 | 19.64 | 16.98 | | | | | 536 | 565 | 593 | 632 | 692 | 748 | 800 | 848 | 894 | | 54 |
| 66 | 23.76 | 20.83 | | | | | | 694 | 728 | 776 | 849 | 918 | 981 | 1040 | 1097 | 1201 | 59 |
| 72 | 28.27 | 25.08 | | | | | | 835 | 876 | 934 | 1023 | 1105 | 1181 | 1253 | 1320 | 1447 | 64 |
| 78 | 33.18 | 29.73 | | | | | | | 1038 | 1107 | 1212 | 1310 | 1400 | 1485 | 1565 | 1715 | 70 |
| 84 | 38.48 | 34.76 | | | | | | | 1214 | 1294 | 1418 | 1531 | 1637 | 1736 | 1830 | 2005 | 75 |
| 90 | 44.18 | 40.19 | | | | | | | | 1496 | 1639 | 1770 | 1893 | 2008 | 2116 | 2318 | 80 |
| 96 | 50.27 | 46.01 | | | | | | | | 1712 | 1876 | 2027 | 2167 | 2298 | 2423 | 2654 | 86 |
| 102 | 56.75 | 52.23 | | | | | | | | 1944 | 2130 | 2300 | 2459 | 2609 | 2750 | 3012 | 91 |
| 108 | 63.62 | 58.83 | | | | | | | | 2090 | 2399 | 2592 | 2771 | 2939 | 3098 | 3393 | 96 |
| 114 | 70.88 | 65.83 | | | | | | | | | 2685 | 2900 | 3100 | 3288 | 3466 | 3797 | 101 |
| 120 | 78.54 | 73.22 | | | | | | | | | 2986 | 3226 | 3448 | 3657 | 3855 | 4223 | 107 |
| 132 | 95.03 | 89.18 | | | | | | | | | 3637 | 3929 | 4200 | 4455 | 4696 | 5144 | 117 |
| 144 | 113.10 | 106.72 | | | | | | | | | 4352 | 4701 | 5026 | 5331 | 5618 | 6155 | 128 |

— PRACTICAL HEIGHTS OF CHIMNEYS —

| | | | |
|---|---|---|---|
| Using Free Burning Bituminous Coal | 75 Ft | Anthracite Pea Coal | 130 Ft. |
| Anthracite of Medium & Large Size | 100 " | Anthracite Buckwheat | 150 " |
| Slow Burning Bituminous Coal | 120 " | Plants 700 H.P & Over Not Less Than | 150 " |

## Diameter or Side of Chimney in Inches Required for Varying Amount of Direct Steam Radiating Surface

| Height of Chimney in Feet | 20 | 30 | 40 | 50 | 60 | 80 | 100 | 120 |
|---|---|---|---|---|---|---|---|---|
| Square Feet of Direct Steam Radiation | Dimensions Given Are Inside Measurements | | | | | | | |
| 250 | 7.4 | 7.0 | 6.7 | 6.4 | 6.2 | 6.0 | 6.0 | 6.0 |
| 500 | | 9.2 | 8.8 | 8.2 | 8.0 | 6.6 | 7.3 | 7.0 |
| 750 | | 10.8 | 10.2 | 9.6 | 9.3 | 8.8 | 8.5 | 8.2 |
| 1000 | | 12.0 | 11.4 | 10.8 | 10.5 | 10.0 | 9.5 | 9.2 |
| 1500 | | 14.4 | 13.4 | 12.8 | 12.4 | 11.5 | 11.2 | 10.8 |
| 2000 | | 16.3 | 15.2 | 14.5 | 14.0 | 13.2 | 12.6 | 12.1 |
| 3000 | | 18.5 | 18.2 | 17.2 | 16.6 | 15.8 | 15.0 | 14.4 |
| 4000 | | 22.2 | 20.8 | 19.6 | 19.0 | 17.8 | 17.0 | 16.3 |
| 5000 | | 24.6 | 23.0 | 21.6 | 21.0 | 19.4 | 18.6 | 18.0 |
| 6000 | | 26.8 | 25.0 | 23.4 | 22.8 | 21.2 | 20.2 | 19.5 |
| 7000 | | 28.8 | 27.0 | 25.5 | 24.4 | 23.0 | 21.6 | 20.8 |
| 8000 | | 30.6 | 28.6 | 26.8 | 26.0 | 24.2 | 23.4 | 22.2 |
| 9000 | | 32.4 | 30.4 | 28.4 | 27.4 | 25.6 | 24.4 | 23.4 |
| 10000 | | 34.0 | 32.0 | 30.0 | 28.6 | 27.0 | 25.4 | 24.6 |
| 15000 | | | 38.4 | 36.2 | 35.0 | 33.0 | 31.0 | 29.2 |
| 20000 | | | 43.0 | 42.0 | 41.0 | 37.0 | 35.0 | 34.0 |
| 30000 | | | | 50.0 | 48.0 | 46.0 | 43.0 | 41.0 |

Reduce All Radiation to Direct

## Storage of Fuel Per Thousand Pounds

### Prepared Stove Size

| | |
|---|---|
| Hard Coal | 18 Cu. Ft. |
| Soft Coal | 20 Cu. Ft. |
| Coke | 34 Cu. Ft. |
| Cord Wood | 38 Cu. Ft. |
| Oil | 18 Cu. Ft. |

# Factors for Determining Size of Vacuum Pumps as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

| Steam | Water | Stroke | Factor | Steam | Water | Stroke | Factor |
|---|---|---|---|---|---|---|---|
|  | 3 | 6 | 4087 |  | 6½ | 12 | 24180 |
|  | 3½ | 6 | 5564 | 7 | 7¼ | 10 | 28280 |
| 4 | 4 | 5 | 6830 |  | 7¼ | 12 | 30075 |
|  | 4 | 6 | 7270 |  | 8 | 7 | 30766 |
|  | 4 | 8 | 8000 |  | 8 | 10 | 34440 |
|  | 4½ | 6 | 9198 | 6 | 8 | 12 | 36625 |
|  | 4½ | 8 | 10125 |  | 8½ | 12 | 41350 |
|  | 5 | 5 | 10720 |  | 9 | 10 | 43626 |
|  | 5 | 6 | 11335 |  | 9 | 12 | 48957 |
|  | 5 | 8 | 12500 | 8 | 9¼ | 12 | 48965 |
|  | 5 | 10 | 13465 |  | 10 | 12 | 57227 |
|  | 5 | 12 | 14308 |  | 10 | 14 | 60250 |
|  | 5½ | 6 | 13740 | 10 | 12 | 12 | 82407 |
| 4½ | 5½ | 8 | 15125 |  | 10 | 16 | 90715 |
|  | 5½ | 10 | 16290 |  | 14 | 16 | 122935 |
|  | 5½ | 12 | 17315 | 12 | 14 | 20 | 133000 |
|  | 6 | 5 | 15390 |  | 16 | 16 | 161270 |
|  | 6 | 6 | 16350 | 14 | 16 | 20 | 173720 |
|  | 6 | 7 | 17215 |  | 18 | 18 | 212200 |
|  | 6 | 8 | 18000 | 16 | 18 | 20 | 219870 |
| 5 | 6 | 10 | 19390 |  | 18 | 24 | 233745 |
|  | 6 | 12 | 20605 | 18 | 20 | 20 | 271440 |
|  | 6½ | 10 | 22758 |  |  |  |  |

In The Foregoing Table The Steam Cylinders of The Pumps Are Proportioned For About 100 Pounds Steam Pressure. Pressures Differing Materially From This Would Require Proportionally Different Steam Cylinders.

Formula $C = D^2 \times .250\sqrt[3]{L}$

C = Direct Radiation + 25% + 50 × N.
N = Number of Units (Traps).
D = Diameter of Water Cylinder.
L = Length of Stroke in inches.

# Pumps

To find the capacity of a pump, per stroke, in gallons.

Rule:—Multiply the area of the cylinder by the length of the stroke and divide by 277.27.

$$\text{Formula} \quad \frac{D^2 \times .7854 \times L}{277.27} = \frac{D^2 \times L}{352.8} \qquad (1)$$

To find the capacity of a pump, per stroke, in pounds.
Rule:—Multiply the area of the cylinder by the length of the stroke and divide by 27.727.

$$\text{Formula} \quad \frac{D^2 \times .7854 \times L}{27.727} = \frac{D^2 \times L}{35.28} \qquad (2)$$

To find the capacity of a pump in gallons, per minute.

Rule:—Multiply (1) by number of strokes per minute.

$$\text{Formula} \quad \frac{D^2 \times L \times N}{352.8} \qquad (3)$$

To find the capacity of a pump in pounds per minute.

Rule:—Multiply (2) by number of strokes per minute.

$$\text{Formula} \quad \frac{D^2 \times L \times N}{35.28} \qquad (4)$$

To find the horse power required to raise water a given height.

Rule:—Multiply the volume in cubic feet per minute, by pressure per square foot and divide by 33000, or weight of water in pounds × height of lift divided by 33000.

$$\text{Formula} = \frac{\text{Vol. in Cu. Ft. per Minute} \times \text{Press per Sq. Ft.}}{33000}$$

$$= \frac{\text{Weight of Water in Pounds} \times \text{Height of Lift}}{33000}$$

Certain allowance should be made for friction, etc., varying from 15 to 25%.

The height of a column of water is equal to pressure per square inch ÷ .433 = pressure per square inch × 2.309.

One Cubic Foot of Water:

| Imperial— | United States— |
|---|---|
| 6.23 Gallons | |
| 1728 Cubic Inches | 7½ Gallons |
| 62.4 Pounds | |

One Gallon of Water:

| Imperial— | United States— |
|---|---|
| 277.274 Cubic Inches | 231 Cubic Inches |
| 10 Pounds | 8⅓ Pounds |

# Boiler Feed Pumps

## (Duplex)

| Size Inches | Stroke Per Plunger Per Min. | Gallons | Sing to Same Work Inches | S T In. | E X In. | S U In. | D I In. | H.P. Based on Lowest Speed |
|---|---|---|---|---|---|---|---|---|
| 3 x 2 x 3 | 100 to 225 | 8 to 20 | 2⅞ | ⅜ | ½ | 1¼ | 1 | 67 |
| 4½x 2¾x 4 | 100 to 200 | 20 to 40 | 4 | ½ | ¾ | 2 | 1½ | 150 to 165 |
| 5¼x 3½x 5 | 100 to 200 | 40 to 80 | 5 | ¾ | 1¼ | 2½ | 1½ | 333 |
| 6 x 4 x 6 | 100 to 150 | 70 to 100 | 5⅝ | 1 | 1½ | 3 | 2 | 580 |
| 7½x 4½x 6 | 100 to 150 | 85 to 125 | 6⅜ | 1½ | 2 | 4 | 3 | 700 |
| 7½x 5 x 6 | 100 to 150 | 100 to 150 | 7 | 1½ | 2 | 4 | 3 | 830 |
| 7½x 4½x10 | 75 to 125 | 100 to 170 | 6⅜ | 1½ | 2 | 4 | 3 | 830 |
| 9 x 5¼x10 | 75 to 125 | 135 to 230 | 7½ | 2 | 2½ | 4 | 3 | 1100 |
| 10 x 6 x10 | 75 to 125 | 180 to 300 | 8½ | 2 | 2½ | 5 | 4 | 1500 |
| 10 x 7 x10 | 75 to 125 | 245 to 410 | 9⅞ | 2 | 2½ | 6 | 5 | 2000 |
| 12 x 7 x10 | 75 to 125 | 245 to 410 | 9⅞ | 2½ | 3 | 6 | 5 | 2000 |
| 14 x 7 x10 | 75 to 125 | 245 to 410 | 9⅞ | 2½ | 3 | 6 | 5 | 2000 |
| 12 x 8½x10 | 75 to 125 | 365 to 610 | 12 | 2½ | 3 | 6 | 5 | 3000 |
| 14 x 8½x10 | 75 to 125 | 365 to 610 | 12 | 2½ | 3 | 6 | 5 | 3000 |
| 16 x 8½x10 | 75 to 125 | 365 to 610 | 12 | 2½ | 3 | 6 | 5 | 3000 |
| 18½x 8½x10 | 75 to 125 | 365 to 610 | 12 | 3 | 4 | 6 | 5 | 3000 |
| 20 x 8½x10 | 75 to 125 | 365 to 610 | 12 | 4 | 5 | 6 | 5 | 3000 |
| 12 x10¼x10 | 75 to 125 | 530 to 890 | 14¼ | 2½ | 3 | 8 | 7 | 4400 |
| 14 x10¼x10 | 75 to 125 | 530 to 890 | 14¼ | 2½ | 3 | 8 | 7 | 4400 |
| 16 x10¼x10 | 75 to 125 | 530 to 890 | 14¼ | 2½ | 3 | 8 | 7 | 4400 |
| 18½x10¼x10 | 75 to 125 | 530 to 890 | 14¼ | 3 | 4 | 8 | 7 | 4400 |
| 20 x10¼x10 | 75 to 125 | 530 to 890 | 14¼ | 4 | 5 | 8 | 7 | 4400 |
| 14 x12 x10 | 75 to 125 | 730 to 1220 | 17 | 2½ | 3 | 10* | 8 | 6000 |
| 16 x12 x10 | 75 to 125 | 730 to 1220 | 17 | 2½ | 3 | 10 | 8 | 6000 |
| 18½x12 x10 | 75 to 125 | 730 to 1220 | 17 | 3 | 4 | 10 | 8 | 6000 |
| 20 x12 x10 | 75 to 125 | 730 to 1220 | 17 | 4 | 5 | 10 | 8 | 6000 |
| 18½x14 x10 | 75 to 125 | 990 to 1660 | 19¾ | 3 | 4 | 12 | 10 | 6000 |
| 20 x14 x10 | 75 to 125 | 990 to 1660 | 19¾ | 4 | 5 | 12 | 10 | 6000 |
| 17 x10 x15 | 50 to 100 | 510 to 1020 | 14 | 3 | .... | 8 | 7 | 8200 |
| 20 x12 x15 | 50 to 100 | 730 to 1460 | 17 | 4 | .... | 12 | 10 | 8200 |
| 20 x15 x15 | 50 to 100 | 1145to2290 | 21 | .... | .... | .... | .... | .... |
| 25 x15 x15 | 50 to 100 | 1145to2290 | ...... | .... | .... | .... | .... | .... |

## Capacities of Mains and Risers as Applied to the Bishop-Babcock Air Line System of Steam Circulation

### One-Eighth Pound Pressure Loss

| Size of Supply Inches | Size of Dry Return Inches | Size of Wet Return Inches | Length of Supply and Return Piping in Feet from Source of Supply to Fartherest Radiator Allowance for Elbows and Valves Must be Added to Measured Distance. Pipe Capacities in Square Feet of Direct Cast Iron Radiation Given for Each Length. Supply Risers Based on Length of Supply Mains. Air Risers ½″ Above First Floor. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 100 | 200 | 300 | 400 | 500 | 750 | 1000 | 1250 | 1500 |
| 1 | 1 | 1 | 62 | 44 | 36 | 31 | 27 | 22 | 19 | 18 | 16 |
| 1¼ | 1 | 1 | 118 | 83 | 70 | 59 | 52 | 44 | 37 | 35 | 30 |
| 1½ | 1¼ | 1 | 189 | 133 | 109 | 93 | 84 | 70 | 60 | 55 | 50 |
| 2 | 1½ | 1¼ | 388 | 280 | 237 | 201 | 182 | 154 | 127 | 117 | 115 |
| 2½ | 2 | 1½ | 657 | 454 | 383 | 322 | 296 | 249 | 208 | 190 | 180 |
| 3 | 2½ | 2 | 1187 | 834 | 657 | 586 | 522 | 435 | 379 | 363 | 340 |
| 3½ | 2½ | 2 | 1710 | 1206 | 1002 | 850 | 775 | 634 | 546 | 503 | 470 |
| 4 | 3 | 2½ | 2450 | 1720 | 1440 | 1220 | 1100 | 910 | 781 | 717 | 670 |
| 4½ | 3 | 2½ | 3200 | 2248 | 1874 | 1590 | 1435 | 1185 | 1011 | 942 | 900 |
| 5 | 3½ | 3 | 4175 | 2947 | 2460 | 2087 | 1882 | 1052 | 1330 | 1235 | 1000 |
| 6 | 3½ | 3 | 6737 | 4742 | 3975 | 3362 | 2992 | 2505 | 2156 | 1987 | 1780 |
| 7 | 4 | 3½ | 10050 | 7147 | 5930 | 5012 | 4490 | 3719 | 3161 | 2477 | 2200 |
| 8 | 4½ | 4 | 13950 | 9860 | 8205 | 6962 | 6230 | 5149 | 4262 | 4027 | 3800 |
| 9 | 5 | 4½ | 19200 | 13780 | 11165 | 9600 | 8640 | 6912 | 5981 | 5545 | 4300 |
| 10 | 6 | 5 | 25300 | 18075 | 14925 | 12650 | 11385 | 9400 | 7962 | 7425 | 7000 |
| 12 | 7 | 6 | 40800 | 28400 | 23675 | 20150 | 18100 | 14925 | 12540 | 11750 | 10000 |
| 14 | 8 | 7 | 59750 | 42200 | 33300 | 28800 | 25600 | 20700 | 18100 | 16500 | 15000 |
| 15 | 8 | 7 | 70200 | 49400 | 40000 | 34000 | 30500 | 24900 | 21400 | 19400 | 17900 |
| 16 | 9 | 8 | 83700 | 59700 | 49200 | 42500 | 37900 | 29900 | 26600 | 24000 | 21800 |

## Pipe Sizing

### Capacities of Mains and Risers as Applied to the Bishop-Babcock Vacu Vapor System of Steam Circulation

| Size of Supply Inches | Size of Return Inches | Length of Supply and Return Piping in Feet from Source of Supply to Farthest Radiator. Allowance for Elbows and Valves Must be Added to Measured Distance. Pipe Capacities in Square Feet of Direct Cast Iron Radiation Given for Each Length. Supply Risers Based on Length of Supply, Return Riser ¾" up to 200°, 1" to 400°, 1¼" to 800°. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 100 | 200 | 300 | 400 | 500 | 750 | 1000 | 1250 | 1500 |
| 1 | 1 | 87 | 64 | 50 | 44 | 38 | 30 | 27 | 25 | 20 |
| 1¼ | 1 | 161 | 114 | 94 | 81 | 71 | 59 | 51 | 45 | 42 |
| 1½ | 1 | 267 | 189 | 149 | 129 | 118 | 97 | 84 | 76 | 70 |
| 2 | 1¼ | 589 | 436 | 363 | 314 | 285 | 242 | 203 | 179 | 169 |
| 2½ | 1¼ | 1026 | 702 | 583 | 502 | 465 | 388 | 330 | 290 | 266 |
| 3 | 1½ | 1862 | 1308 | 1023 | 910 | 816 | 671 | 606 | 580 | 483 |
| 3½ | 1½ | 2662 | 1905 | 1524 | 1316 | 1212 | 968 | 871 | 740 | 702 |
| 4 | 2 | 3725 | 2630 | 2152 | 1848 | 1669 | 1383 | 1212 | 1066 | 992 |
| 4½ | 2 | 4993 | 3512 | 2866 | 2468 | 2230 | 1814 | 1598 | 1450 | 1330 |
| 5 | 2½ | 6620 | 4698 | 3845 | 3305 | 2992 | 2420 | 2152 | 1936 | 1766 |
| 6 | 3 | 10658 | 7527 | 6033 | 5304 | 4692 | 3896 | 3486 | 3100 | 2810 |
| 7 | 3½ | 15500 | 11150 | 9029 | 7713 | 6883 | 5616 | 4936 | 4550 | 4040 |
| 8 | 4 | 21783 | 15500 | 12433 | 10850 | 9680 | 7850 | 6583 | 6100 | 5813 |
| 9 | 4½ | 29066 | 21800 | 16466 | 14533 | 13083 | 10333 | 9100 | 8133 | 7550 |
| 10 | 5 | 38733 | 28100 | 22550 | 19366 | 17433 | 14116 | 12316 | 11150 | 10166 |
| 12 | 6 | 61900 | 43600 | 35542 | 30772 | 27533 | 22266 | 19116 | 17516 | 16266 |
| 14 | 7 | 82333 | 58133 | 45900 | 39700 | 35316 | 28550 | 24966 | 22750 | 20700 |
| 15 | 7 | 96806 | 68133 | 55166 | 47283 | 42083 | 36016 | 29516 | 26783 | 24683 |
| 16 | 8 | 115333 | 82325 | 67825 | 58583 | 52266 | 41733 | 36683 | 33100 | 30033 |

## Pipe Sizing

### Capacities of Mains and Risers as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

• ONE QUARTER POUND PRESSURE LOSS •

| Size of Supply | Length of Supply and Return Piping in Feet From Source of Supply To Farthest Radiator. Allowance For Elbows and Valves Must Be Added To Measured Distance Pipe Capacities in Square Feet of Direct Cast Iron Radiation Given For Each Length. Supply Risers Based on Length of Supply: Return Riser ¾ up To 800#, 1" To 1500#, 1¼" To 2400# | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| inches | 200 | 300 | 400 | 500 | 750 | 1000 | 1250 | 1500 | 2000 |
| 1 | 66 | 52 | 46 | 40 | 31 | 29 | 26 | | |
| 1¼ | 118 | 97 | 84 | 75 | 61 | 53 | 47 | 43 | 38 |
| 1½ | 195 | 154 | 133 | 123 | 101 | 87 | 79 | 72 | 62 |
| 2 | 450 | 375 | 325 | 295 | 250 | 210 | 185 | 175 | 150 |
| 2½ | 725 | 600 | 525 | 480 | 400 | 340 | 300 | 275 | 245 |
| 3 | 1350 | 1100 | 940 | 850 | 700 | 625 | 600 | 500 | 430 |
| 3½ | 1950 | 1575 | 1360 | 1250 | 1000 | 900 | 800 | 725 | 625 |
| 4 | 2725 | 2225 | 1910 | 1725 | 1400 | 1250 | 1100 | 1025 | 875 |
| 4½ | 3625 | 2960 | 2550 | 2300 | 1875 | 1650 | 1500 | 1375 | 1175 |
| 5 | 4850 | 3975 | 3410 | 3090 | 2500 | 2225 | 2000 | 1825 | 1600 |
| 6 | 7775 | 6400 | 5475 | 4850 | 4025 | 3600 | 3200 | 2900 | 2540 |
| 7 | 11500 | 9325 | 7960 | 7100 | 5800 | 5100 | 4700 | 4175 | 3660 |
| 8 | 16000 | 13000 | 11200 | 10000 | 8100 | 6800 | 6300 | 6000 | 5100 |
| 9 | 22000 | 17000 | 15000 | 13500 | 11000 | 9400 | 8400 | 7800 | 6850 |
| 10 | 29000 | 23300 | 20000 | 18000 | 14600 | 12700 | 11500 | 10500 | 9120 |
| 12 | 45000 | 36750 | 31810 | 28400 | 23000 | 19700 | 18100 | 16800 | 16200 |
| 14 | 60000 | 47400 | 41000 | 36500 | 29500 | 25800 | 23500 | 21400 | 18600 |
| 15 | 70000 | 57000 | 49100 | 43500 | 35500 | 30500 | 27700 | 25500 | 22000 |
| 16 | 85000 | 70000 | 60500 | 54000 | 43600 | 37900 | 34200 | 31000 | 27000 |

## Pipe Sizing

### Capacities of Mains and Risers as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

·HALF POUND PRESSURE LOSS·

| SIZE OF SUPPLY | LENGTH OF SUPPLY AND RETURN PIPING IN FEET FROM SOURCE OF SUPPLY TO FARTHEST RADIATOR.<br>ALLOWANCE FOR ELBOWS AND VALVES MUST BE ADDED TO MEASURED DISTANCE<br>PIPE CAPACITIES IN SQUARE FEET OF DIRECT CAST IRON RADIATION GIVEN FOR EACH LENGTH.<br>SUPPLY RISERS BASED ON LENGTH OF SUPPLY: RETURN RISER ¾" UP TO 800#, 1" TO 1500#, 1¼" TO 2400# | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ·INCHES | 200 | 300 | 400 | 500 | 750 | 1000 | 1250 | 1500 | 2000 |
| 1 | 92 | 72 | 64 | 56 | 44 | 40 | 36 | | |
| 1¼ | 166 | 136 | 118 | 100 | 86 | 74 | 66 | 60 | |
| 1½ | 274 | 216 | 188 | 172 | 142 | 122 | 110 | 102 | |
| 2 | 632 | 528 | 456 | 414 | 350 | 294 | 260 | 246 | |
| 2½ | 1020 | 850 | 720 | 676 | 564 | 480 | 420 | 386 | |
| 3 | 1900 | 1420 | 1320 | 1174 | 964 | 880 | 840 | 700 | |
| 3½ | 2740 | 2200 | 1910 | 1760 | 1404 | 1264 | 1120 | 1020 | |
| 4 | 3800 | 3120 | 2680 | 2420 | 1970 | 1760 | 1550 | 1440 | |
| 4½ | 5100 | 4160 | 3580 | 3240 | 2630 | 2320 | 2100 | 1930 | |
| 5 | 6820 | 5580 | 4800 | 4340 | 3510 | 3120 | 2810 | 2560 | |
| 6 | 10920 | 9000 | 7700 | 6800 | 5650 | 5060 | 4500 | 4080 | |
| 7 | 16200 | 13100 | 11200 | 10000 | 8150 | 7160 | 6600 | 5860 | |
| 8 | 22500 | 18300 | 15700 | 14040 | 11400 | 9550 | 8850 | 8440 | |
| 9 | 30900 | 23900 | 21100 | 19000 | 14500 | 13200 | 11800 | 10950 | |
| 10 | 40800 | 32700 | 28100 | 25300 | 20500 | 17900 | 16200 | 14750 | |
| 12 | 63200 | 51500 | 44600 | 40000 | 32300 | 27800 | 25400 | 23600 | |
| 14 | 84400 | 66600 | 57600 | 51200 | 41400 | 36200 | 33000 | 30000 | |
| 15 | 98800 | 80000 | 68200 | 61000 | 49800 | 42800 | 38800 | 35800 | |
| 16 | 119500 | 98500 | 85000 | 75800 | 59800 | 53200 | 48000 | 43600 | |

## Pipe Sizing

### Capacities of Mains and Risers as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

· THREE QUARTER POUND PRESSURE LOSS ·

| SIZE OF SUPPLY | LENGTH OF SUPPLY AND RETURN PIPING IN FEET FROM SOURCE OF SUPPLY TO FARTHEST RADIATOR. ALLOWANCE FOR ELBOWS AND VALVES MUST BE ADDED TO MEASURED DISTANCE. PIPE CAPACITIES IN SQUARE FEET OF DIRECT CAST IRON RADIATION GIVEN FOR EACH LENGTH. SUPPLY RISERS BASED ON LENGTH OF SUPPLY • RETURN RISER ¾ UP TO 800□', 1" TO 1500□', 1¼" TO 2400□' | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| INCHES | 200 | 300 | 400 | 500 | 750 | 1000 | 1250 | 1500 | 2000 |
| 1 | 101 | 83 | 75 | 67 | 52 | 50 | 46 | 40 | 35 |
| 1¼ | 184 | 156 | 138 | 123 | 105 | 92 | 83 | 76 | 70 |
| 1½ | 305 | 251 | 221 | 204 | 173 | 152 | 139 | 128 | 120 |
| 2 | 690 | 593 | 522 | 476 | 409 | 354 | 320 | 298 | 280 |
| 2½ | 1156 | 1012 | 880 | 814 | 693 | 605 | 546 | 500 | 485 |
| 3 | 2083 | 1720 | 1543 | 1398 | 1179 | 1069 | 1020 | 876 | 830 |
| 3½ | 3046 | 2565 | 2273 | 2093 | 1731 | 1573 | 1430 | 1302 | 1240 |
| 4 | 4299 | 3648 | 3206 | 2915 | 2440 | 2203 | 1993 | 1839 | 1745 |
| 4½ | 5670 | 4846 | 4313 | 3908 | 3268 | 2943 | 2726 | 2493 | 2350 |
| 5 | 7660 | 6533 | 5766 | 5255 | 4400 | 3986 | 3670 | 3328 | 3200 |
| 6 | 12383 | 10612 | 9380 | 8395 | 7143 | 6453 | 5873 | 5113 | 4780 |
| 7 | 18376 | 15592 | 13746 | 12426 | 10146 | 9392 | 8763 | 7876 | 7300 |
| 8 | 25726 | 21910 | 19449 | 17563 | 14721 | 12772 | 11926 | 11187 | 10500 |
| 9 | 35023 | 28815 | 26006 | 23678 | 19659 | 17599 | 16130 | 14843 | 14000 |
| 10 | 46283 | 39085 | 34653 | 31558 | 26573 | 23715 | 21913 | 20030 | 19000 |
| 12 | 72356 | 61925 | 55293 | 50202 | 42292 | 37447 | 34893 | 32256 | 32000 |
| 14 | 102200 | 80700 | 75300 | 68372 | 57935 | 52048 | 48436 | 44280 | 42000 |
| 15 | 119800 | 97000 | 85200 | 74000 | 60400 | 58775 | 53318 | 48540 | 44000 |
| 16 | 144750 | 119250 | 103000 | 91900 | 73500 | 64500 | 58200 | 52800 | 48000 |

## Pipe Sizing

### Capacities of Mains and Risers as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

·ONE POUND PRESSURE LOSS·

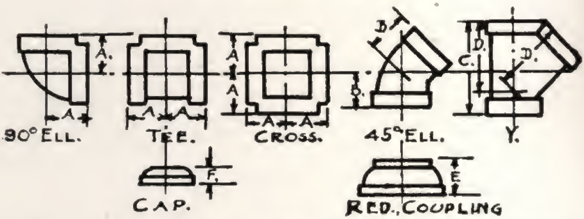
| SIZE OF SUPPLY | LENGTH OF SUPPLY AND RETURN PIPING IN FEET FROM SOURCE OF SUPPLY TO FARTHEST RADIATOR.<br>ALLOWANCE FOR ELBOWS AND VALVES MUST BE ADDED TO MEASURED DISTANCE<br>PIPE CAPACITIES IN SQUARE FEET OF DIRECT CAST IRON RADIATION GIVEN FOR EACH LENGTH.<br>SUPPLY RISERS BASED ON LENGTH OF SUPPLY + RETURN RISER ¾ UP TO 800#, 1" TO 1500#, 1¼ TO 2400# | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| INCHES | 200 | 300 | 400 | 500 | 750 | 1000 | 1250 | 1500 | 2000 |
| 1 | 132 | 104 | 92 | 80 | 62 | 58 | 52 | | |
| 1¼ | 236 | 194 | 168 | 150 | 122 | 106 | 94 | 86 | 76 |
| 1½ | 390 | 308 | 266 | 246 | 202 | 174 | 158 | 144 | 124 |
| 2 | 900 | 750 | 650 | 590 | 500 | 420 | 370 | 350 | 300 |
| 2½ | 1450 | 1200 | 1050 | 960 | 800 | 680 | 600 | 550 | 490 |
| 3 | 2700 | 2200 | 1880 | 1700 | 1400 | 1250 | 1200 | 1000 | 860 |
| 3½ | 3900 | 3150 | 2720 | 2500 | 2000 | 1800 | 1600 | 1450 | 1250 |
| 4 | 5450 | 4450 | 3820 | 3450 | 2800 | 2500 | 2200 | 2050 | 1750 |
| 4½ | 7250 | 5920 | 5100 | 4600 | 3750 | 3300 | 3000 | 2750 | 2350 |
| 5 | 9700 | 7950 | 6820 | 6180 | 5060 | 4450 | 4000 | 3650 | 3200 |
| 6 | 15550 | 12800 | 10950 | 9700 | 8050 | 7200 | 6400 | 5800 | 5080 |
| 7 | 23000 | 18650 | 15920 | 14200 | 11600 | 10200 | 9400 | 8350 | 7320 |
| 8 | 32000 | 26000 | 22400 | 20000 | 16200 | 13600 | 12600 | 12000 | 10200 |
| 9 | 44000 | 34000 | 30000 | 27000 | 22000 | 18800 | 16800 | 15600 | 13700 |
| 10 | 58000 | 46600 | 40000 | 36000 | 29200 | 25400 | 23000 | 21000 | 18240 |
| 12 | 90000 | 73500 | 63600 | 56800 | 46000 | 39400 | 36200 | 33600 | 32400 |
| 14 | 120000 | 94800 | 82000 | 73000 | 59000 | 51600 | 47000 | 42800 | 37200 |
| 15 | 140000 | 114000 | 98200 | 87000 | 71000 | 61000 | 55400 | 51000 | 44000 |
| 16 | 170000 | 140000 | 121000 | 108000 | 87200 | 75800 | 68400 | 62000 | 54400 |

# Pipe Sizing

## Capacities of Mains and Risers as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

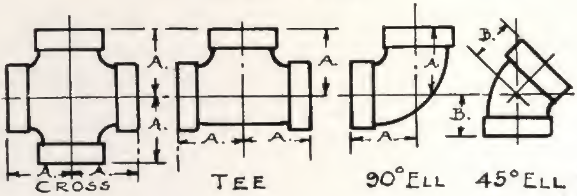
| Size of Return | Length of Return Piping in Feet from Suction of Pump to Farthest Radiator. Allowance for Elbows and Lifts Must Be Added to Measured Distance. Pipe Capacities in Square Feet of Direct Cast Iron Radiation Given for Each Length Based on One Third of a Pound of Condensation per Square Foot per Hour. | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 | 1250 | 1500 |
| 1 | 1500 | 1450 | 1400 | 1200 | | | | | | | | |
| 1¼ | 3200 | 3150 | 3100 | 2500 | 2500 | | | | | | | |
| 1½ | 5000 | 4500 | 4000 | 3500 | 3250 | 3000 | 2900 | 2800 | | | | |
| 2 | 8000 | 7000 | 6250 | 5775 | 5000 | 4850 | 4500 | 4250 | 4100 | 4000 | | |
| 2½ | 11500 | 10500 | 9500 | 9000 | 8000 | 7250 | 6950 | 6250 | 6000 | 5000 | 4900 | 4500 |
| 3 | 19000 | 18000 | 16500 | 15000 | 14000 | 13000 | 12000 | 11500 | 10900 | 10500 | 9750 | 8500 |
| 3½ | 28000 | 26000 | 24500 | 23000 | 22000 | 20700 | 19900 | 18000 | 17500 | 17000 | 16800 | 15000 |
| 4 | 40000 | 38000 | 36000 | 34500 | 32700 | 31200 | 30000 | 28700 | 28000 | 27000 | 25200 | 24500 |
| 4½ | 54500 | 51700 | 49500 | 47000 | 45000 | 43500 | 41700 | 40000 | 39000 | 37500 | 35000 | 33750 |
| 5 | 71000 | 67500 | 64000 | 61000 | 58000 | 55000 | 52700 | 50700 | 49000 | 47500 | 44000 | 41700 |
| 6 | 91000 | 87000 | 83000 | 80000 | 76500 | 73500 | 71000 | 68500 | 66500 | 64500 | 60500 | 57700 |
| 7 | 115500 | 111500 | 108000 | 104000 | 101500 | 97700 | 94500 | 92000 | 90000 | 87000 | 82000 | 78500 |
| 8 | 146000 | 141500 | 137000 | 133000 | 129500 | 126000 | 122500 | 119500 | 116500 | 114000 | 107500 | 102000 |

## General Dimensions of Standard Cast Iron Screwed Fittings



| Size Inches | "A" Inches | "B" Inches | "C" Inches | "D" Inches | "E" Inches | "F" Inches |
|---|---|---|---|---|---|---|
| ¼ | 13/16 | ¾ | .... | .... | .... | .. |
| ⅜ | 15/16 | 13/16 | .... | .... | .... | .... |
| ½ | 1⅛ | ⅞ | 2½ | 1⅞ | .... | .... |
| ¾ | 1 5/16 | 1 | 3 | 2¼ | .. . | .... |
| 1 | 1 7/16 | 1⅛ | 3½ | 2¾ | .... | .... |
| 1¼ | 1¾ | 1 5/16 | 4¼ | 3¼ | .... | .... |
| 1½ | 1 15/16 | 1 7/16 | 4⅞ | 3 13/16 | .... | .... |
| 2 | 2¼ | 1 11/16 | 5¾ | 4½ | .... | .... |
| 2½ | 2 11/16 | 1 15/16 | 6¼ | 5 3/16 | .... | .... |
| 3 | 3⅛ | 2 3/16 | 7⅞ | 6⅛ | 2 15/16 | .... |
| 3½ | 3 7/16 | 2⅜ | 8⅞ | 6⅞ | 3⅛ | .... |
| 4 | 3¾ | 2⅝ | 9¾ | 7⅝ | 3⅜ | 2 1/16 |
| 4½ | 4 1/16 | 2 13/16 | 11⅝ | 9¼ | 3⅝ | 2 3/16 |
| 5 | 4 7/16 | 3 1/16 | 12⅝ | 9¼ | 3⅞ | 2⅜ |
| 6 | 5⅛ | 3 7/16 | 13 7/16 | 10¾ | 4⅜ | 2⅝ |
| 7 | 5 13/16 | 3⅞ | 15¼ | 12¼ | 4 13/16 | 2⅞ |
| 8 | 6½ | 4¼ | 16 15/16 | 13 5/16 | 5¼ | 3⅛ |
| 9 | 7 3/16 | 4 11/16 | 20 11/16 | 16¾ | 5 11/16 | 3⅜ |
| 10 | 7⅞ | 5 3/16 | 20 11/16 | 16¾ | 6 3/16 | 3⅝ |
| 12 | 9¼ | 6 | 24⅛ | 19⅝ | 7⅛ | 4¼ |

## General Dimensions of Extra Heavy Cast Iron Screwed Fittings



| Size, Inches | "A" Inches | "B" Inches |
|---|---|---|
| 1 | 2 | 1⅜ |
| 1¼ | 2¼ | 1½ |
| 1½ | 2 9/16 | 1⅝ |
| 2 | 3 | 1 13/16 |
| 2½ | 3½ | 2¼ |
| 3 | 4⅛ | 2½ |
| 3½ | 4 11/16 | 2 9/16 |
| 4 | 5⅛ | 2¾ |

# Extra Heavy Flanges

## All dimensions in inches

| **Size of Pipe** | **Diameter of Flange** | **Thickness of Flange** | **Diameter of Bolt Circle** | **Number of Bolts** | **Size of Bolts** |
|---|---|---|---|---|---|
| 1 | 4½ | 11/16 | 3¼ | 4 | ½ |
| 1¼ | 5 | ¾ | 3¾ | 4 | ½ |
| 1½ | 6 | 13/16 | 4½ | 4 | ⅝ |
| 2 | 6½ | ⅞ | 5 | 4 | ⅝ |
| 2½ | 7½ | 1 | 5⅞ | 4 | ¾ |
| 3 | 8¼ | 1⅛ | 6⅝ | 8 | ¾ |
| 3½ | 9 | 1 3/16 | 7¼ | 8 | ¾ |
| 4 | 10 | 1¼ | 7⅞ | 8 | ¾ |
| 4½ | 10½ | 1 5/16 | 8½ | 8 | ¾ |
| 5 | 11 | 1⅜ | 9¼ | 8 | ¾ |
| 6 | 12½ | 1 7/16 | 10⅝ | 12 | ¾ |
| 7 | 14 | 1½ | 11⅞ | 12 | ⅞ |
| 8 | 15 | 1⅝ | 13 | 12 | ⅞ |
| 9 | 16¼ | 1¾ | 14 | 12 | 1 |
| 10 | 17½ | 1⅞ | 15¼ | 16 | 1 |
| 12 | 20½ | 2 | 17¾ | 16 | 1⅛ |
| 14 O. D. | 23 | 2⅛ | 20¼ | 20 | 1⅛ |
| 15 O. D. | 24½ | 2 3/16 | 21½ | 20 | 1¼ |
| 16 O. D. | 25½ | 2¼ | 22½ | 20 | 1¼ |
| 18 O. D. | 28 | 2⅜ | 24¾ | 24 | 1¼ |
| 20 O. D. | 30½ | 2½ | 27 | 24 | 1⅜ |
| 22 O. D. | 33 | 2⅝ | 29¼ | 24 | 1½ |
| 24 O. D. | 36 | 2¾ | 32 | 24 | 1⅝ |

# Dimensions of Standard Flanges

| Size of Pipe Inches | Diameter of Flange Inches | Thickness of Flange Inches | Diameter of Bolt Circle Inches | No. of Bolt Holes | Diameter of Bolt Holes Inches |
|---|---|---|---|---|---|
| 2 | 6 | ⅝ | 4¾ | 4 | ¾ |
| 2½ | 7 | 11/16 | 5½ | 4 | ¾ |
| 3 | 7½ | ¾ | 6 | 4 | ¾ |
| 3½ | 8½ | 13/16 | 7 | 4 | ¾ |
| 4 | 9 | 15/16 | 7½ | 8 | ¾ |
| 4½ | 9¼ | 15/16 | 7¾ | 8 | ⅞ |
| 5 | 10 | 15/16 | 8½ | 8 | ⅞ |
| 6 | 11 | 1 | 9½ | 8 | ⅞ |
| 7 | 12½ | 1 1/16 | 10¾ | 8 | ⅞ |
| 8 | 13½ | 1⅛ | 11¾ | 8 | ⅞ |
| 9 | 15 | 1⅛ | 13¼ | 12 | ⅞ |
| 10 | 16 | 1 3/16 | 14¼ | 12 | 1 |
| 12 | 19 | 1¼ | 17 | 12 | 1 |
| 14 | 21 | 1⅜ | 18¾ | 12 | 1⅛ |
| 16 | 23½ | 1 7/16 | 21¼ | 16 | 1⅛ |

# Measurements of Rooms

## Square Feet of Wall Surface

| Running Feet of Wall | CEILING HEIGHTS—Feet | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 8 | 8½ | 9 | 9½ | 10 | 10½ | 11 | 11½ | 12 | 13 | 14 | 15 |
| 6 | 48 | 51 | 54 | 57 | 60 | 63 | 66 | 69 | 72 | 78 | 84 | 90 |
| 6½ | 52 | 55 | 59 | 62 | 65 | 68 | 72 | 75 | 78 | 85 | 91 | 98 |
| 7 | 56 | 60 | 63 | 67 | 70 | 74 | 77 | 81 | 84 | 91 | 98 | 105 |
| 7½ | 60 | 64 | 68 | 72 | 75 | 79 | 83 | 86 | 90 | 98 | 105 | 113 |
| 8 | 64 | 68 | 72 | 76 | 80 | 84 | 88 | 92 | 96 | 104 | 112 | 120 |
| 8½ | 68 | 72 | 77 | 81 | 85 | 89 | 94 | 98 | 102 | 111 | 119 | 128 |
| 9 | 72 | 76 | 81 | 86 | 90 | 94 | 99 | 104 | 108 | 117 | 126 | 135 |
| 9½ | 76 | 81 | 86 | 90 | 95 | 100 | 105 | 109 | 114 | 124 | 133 | 143 |
| 10 | 80 | 85 | 90 | 95 | 100 | 105 | 110 | 115 | 120 | 130 | 140 | 150 |
| 10½ | 84 | 89 | 95 | 100 | 105 | 110 | 116 | 121 | 126 | 137 | 147 | 158 |
| 11 | 88 | 94 | 99 | 105 | 110 | 116 | 121 | 127 | 132 | 143 | 154 | 165 |
| 11½ | 92 | 98 | 104 | 109 | 115 | 121 | 127 | 132 | 138 | 150 | 161 | 173 |
| 12 | 96 | 102 | 108 | 114 | 120 | 126 | 132 | 138 | 144 | 156 | 168 | 180 |
| 12½ | 100 | 106 | 113 | 119 | 125 | 131 | 138 | 144 | 150 | 163 | 175 | 188 |
| 13 | 104 | 111 | 117 | 123 | 130 | 137 | 143 | 150 | 156 | 169 | 182 | 195 |
| 13½ | 108 | 115 | 122 | 129 | 135 | 142 | 149 | 155 | 162 | 176 | 189 | 203 |
| 14 | 112 | 119 | 126 | 133 | 140 | 147 | 154 | 161 | 168 | 182 | 196 | 210 |
| 14½ | 116 | 123 | 131 | 138 | 145 | 152 | 160 | 167 | 174 | 189 | 203 | 218 |
| 15 | 120 | 128 | 135 | 143 | 150 | 158 | 165 | 173 | 180 | 195 | 210 | 225 |
| 15½ | 124 | 132 | 140 | 147 | 155 | 163 | 171 | 178 | 186 | 202 | 217 | 233 |
| 16 | 128 | 136 | 144 | 152 | 160 | 168 | 176 | 184 | 192 | 208 | 224 | 240 |
| 16½ | 132 | 140 | 149 | 157 | 165 | 173 | 182 | 190 | 198 | 215 | 231 | 248 |
| 17 | 136 | 145 | 153 | 162 | 170 | 179 | 187 | 196 | 204 | 221 | 238 | 255 |
| 17½ | 140 | 149 | 158 | 166 | 175 | 184 | 193 | 201 | 210 | 228 | 245 | 263 |
| 18 | 144 | 153 | 162 | 171 | 180 | 189 | 198 | 207 | 216 | 234 | 252 | 270 |
| 19 | 152 | 162 | 171 | 181 | 190 | 200 | 209 | 219 | 228 | 247 | 266 | 285 |
| 20 | 160 | 170 | 180 | 190 | 200 | 210 | 220 | 230 | 240 | 260 | 280 | 300 |
| 21 | 168 | 179 | 189 | 200 | 210 | 221 | 231 | 242 | 252 | 273 | 294 | 315 |
| 22 | 176 | 187 | 198 | 209 | 220 | 231 | 242 | 253 | 264 | 286 | 308 | 330 |
| 23 | 184 | 196 | 207 | 218 | 230 | 242 | 253 | 264 | 276 | 299 | 322 | 345 |
| 24 | 192 | 204 | 216 | 228 | 240 | 252 | 264 | 276 | 288 | 312 | 336 | 360 |
| 25 | 200 | 213 | 225 | 238 | 250 | 263 | 275 | 288 | 300 | 325 | 350 | 375 |
| 26 | 208 | 221 | 234 | 247 | 260 | 273 | 286 | 299 | 312 | 338 | 364 | 390 |
| 27 | 216 | 230 | 243 | 257 | 270 | 284 | 297 | 311 | 324 | 351 | 378 | 405 |
| 28 | 224 | 238 | 252 | 266 | 280 | 294 | 308 | 322 | 336 | 364 | 392 | 420 |
| 29 | 232 | 247 | 261 | 276 | 290 | 305 | 319 | 334 | 348 | 377 | 406 | 435 |
| 30 | 240 | 255 | 270 | 285 | 300 | 315 | 330 | 345 | 360 | 390 | 420 | 450 |
| 31 | 248 | 264 | 279 | 295 | 310 | 326 | 341 | 357 | 372 | 403 | 434 | 465 |
| 32 | 256 | 272 | 288 | 304 | 320 | 336 | 352 | 368 | 384 | 416 | 448 | 480 |

In order to simplify calculations of the sort listed in the above table and those following, dimensions of under 3 inches have been omitted, that is, 9 inches should be extended to next even foot, and 3 inches over a foot dropped to the nearest even foot. Where, for example, a room is 9′ 2″ by 12′ 10″ with an 8′ 10″ ceiling, such a room may be considered a 9—13—9 room.

# Measurements of Rooms

## Full Area of Two-Pane Windows

Giving the Total Area of Two-Pane Windows, including the Sash

| Width Glass | Width of Open'g | Height Glass | 18" | 20" | 22" | 24" | 26" | 28" | 30" | 32" | 34" | 36" | 38" | 40" | 42" | 44" | 46" | 48" | 50" | 52" | 54" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| In. | Ft. In. | Height Open'g | 3'-6" | 3'-10" | 4'-2" | 4'-6" | 4'-10" | 5'-2" | 5'-6" | 5'-10" | 6'-2" | 6'-6" | 6'-10" | 7'-2" | 7'-6" | 7'-10" | 8'-2" | 8'-6" | 8'-10" | 9'-2" | 9'-6" |
| 16 | 1- 8 | Standard Sizes of Two-Light Windows | 5.8 | 6.4 | 7.0 | 7.5 | 8.0 | 8.6 | 9.2 | 9.7 | 10.3 | 10.8 | 11.4 | 11.9 | 12.5 | 13.0 | 13.6 | 14.2 | 14.7 | 15.2 | 15.8 |
| 18 | 1-10 | | 6.4 | 7.0 | 7.6 | 8.2 | 8.9 | 9.5 | 10.1 | 10.7 | 11.3 | 11.9 | 12.5 | 13.1 | 13.7 | 14.3 | 15.0 | 15.6 | 16.2 | 16.8 | 17.4 |
| 20 | 2- 0 | | 7.0 | 7.7 | 8.3 | 9.0 | 9.7 | 10.3 | 11.0 | 11.7 | 12.3 | 13.0 | 13.6 | 14.3 | 15.0 | 15.6 | 16.3 | 17.0 | 17.7 | 18.3 | 19.0 |
| 22 | 2- 2 | | 7.6 | 8.3 | 9.0 | 9.7 | 10.5 | 11.2 | 11.9 | 12.6 | 13.4 | 14.0 | 14.7 | 15.5 | 16.2 | 17.0 | 17.7 | 18.4 | 19.2 | 19.8 | 20.6 |
| 24 | 2- 4 | | 8.2 | 8.9 | 9.7 | 10.5 | 11.3 | 12.0 | 12.8 | 13.6 | 14.4 | 15.1 | 15.9 | 16.7 | 17.4 | 18.2 | 19.0 | 19.8 | 20.6 | 21.4 | 22.2 |
| 26 | 2- 6 | | 8.7 | 9.6 | 10.4 | 11.2 | 12.0 | 12.8 | 13.7 | 14.6 | 15.4 | 16.2 | 17.1 | 17.9 | 18.7 | 19.5 | 20.4 | 21.2 | 22.0 | 23.0 | 23.8 |
| 28 | 2- 8 | | 9.3 | 10.2 | 11.1 | 12.0 | 12.9 | 13.8 | 14.7 | 15.5 | 16.4 | 17.3 | 18.2 | 19.1 | 20.0 | 20.8 | 21.8 | 22.6 | 23.5 | 24.4 | 25.3 |
| 30 | 2-10 | | 10.0 | 10.8 | 11.8 | 12.8 | 13.7 | 14.6 | 15.6 | 16.5 | 17.5 | 18.4 | 19.3 | 20.3 | 21.2 | 22.2 | 23.2 | 24.0 | 25.0 | 26.0 | 27.0 |
| 32 | 3- 0 | | 10.5 | 11.5 | 12.5 | 13.5 | 14.5 | 15.5 | 16.5 | 17.5 | 18.5 | 19.5 | 20.5 | 21.5 | 22.5 | 23.5 | 24.5 | 25.5 | 26.5 | 27.5 | 28.5 |
| 34 | 3- 2 | | 11.0 | 12.1 | 13.2 | 14.3 | 15.3 | 16.4 | 17.4 | 18.5 | 19.5 | 20.6 | 21.6 | 22.6 | 23.7 | 24.8 | 25.8 | 27.0 | 28.0 | 29.0 | 30.0 |
| 36 | 3- 4 | | 11.7 | 12.8 | 13.9 | 15.0 | 16.1 | 17.2 | 18.3 | 19.5 | 20.5 | 21.6 | 22.8 | 23.8 | 25.0 | 26.1 | 27.2 | 28.3 | 29.4 | 30.5 | 31.7 |
| 38 | 3- 6 | | 12.2 | 13.4 | 14.6 | 15.8 | 16.9 | 18.0 | 19.2 | 20.4 | 21.6 | 22.7 | 24.0 | 25.0 | 26.2 | 27.4 | 28.6 | 29.8 | 31.0 | 32.1 | 33.2 |
| 40 | 3- 8 | | 12.8 | 14.0 | 15.3 | 16.5 | 17.7 | 18.9 | 20.1 | 21.4 | 22.6 | 23.8 | 25.1 | 26.2 | 27.4 | 28.7 | 30.0 | 31.2 | 32.4 | 33.6 | 34.9 |
| 42 | 3-10 | | 13.4 | 14.7 | 16.0 | 17.3 | 18.5 | 19.8 | 21.0 | 22.4 | 23.6 | 24.9 | 26.2 | 27.4 | 28.6 | 30.0 | 31.3 | 32.6 | 33.8 | 35.0 | 36.4 |
| 44 | 4- 0 | | 14.0 | 15.3 | 16.7 | 18.0 | 19.3 | 20.7 | 22.0 | 23.4 | 24.6 | 26.0 | 27.3 | 28.6 | 30.0 | 31.3 | 32.6 | 34.0 | 35.3 | 36.5 | 38.0 |
| 46 | 4- 2 | | 14.6 | 16.0 | 17.4 | 18.8 | 20.1 | 21.5 | 23.0 | 24.4 | 25.6 | 27.1 | 28.4 | 29.8 | 31.2 | 32.6 | 34.0 | 35.5 | 36.8 | 38.2 | 39.6 |
| 48 | 4- 4 | | 15.2 | 16.6 | 18.0 | 19.5 | 20.9 | 22.4 | 23.8 | 25.3 | 26.7 | 28.1 | 29.5 | 31.0 | 32.4 | 34.0 | 35.4 | 36.8 | 38.3 | 39.6 | 41.0 |
| 50 | 4- 6 | | 15.7 | 17.2 | 18.7 | 20.3 | 21.8 | 23.2 | 24.8 | 26.2 | 27.7 | 29.2 | 30.7 | 32.2 | 33.7 | 35.2 | 36.7 | 38.2 | 39.7 | 41.2 | 42.6 |
| 52 | 4- 8 | | 16.3 | 17.9 | 19.4 | 21.0 | 22.5 | 24.0 | 25.6 | 27.2 | 28.7 | 30.3 | 31.8 | 33.4 | 35.0 | 36.5 | 38.0 | 39.6 | 41.2 | 42.7 | 44.2 |
| 54 | 4-10 | | 16.9 | 18.5 | 20.1 | 21.8 | 23.4 | 25.0 | 26.6 | 28.2 | 29.8 | 31.4 | 32.9 | 34.6 | 36.2 | 37.8 | 39.5 | 41.0 | 42.7 | 44.3 | 46.0 |
| 56 | 5- 0 | | 17.5 | 19.3 | 20.8 | 22.5 | 24.2 | 25.8 | 27.5 | 29.0 | 30.8 | 32.5 | 34.0 | 35.8 | 37.5 | 39.8 | 40.8 | 42.5 | 44.2 | 46.0 | 47.5 |

## Standard Data

| | | |
|---|---|---|
| Diameter | × 3.1416 | = Circumference |
| Circumference | × .3183 | = Diameter |
| Diameter$^2$ | × .7854 | = Area of circle |
| Area of Circle | × 1.2732 | = Area of circumscribed square |
| Area of Circle | × .63662 | = Area of inscribed square |
| Dia. of circle | × .88623 | = Side of equal square |
| Dia. of circle | × .7071 | = Side of inscribed square |
| Circumference of circle | × 1.1284 | = Perimeter of equal square |
| Side of square | × 1.4142 | = Dia. of circumscribed circle |
| Side of square | × 1.1284 | = Dia. of equal circle |
| Perimeter of square | × .88623 | = Circumference of equal circle |
| Diameter$^2$ | × 3.1416 | = Surface of sphere |
| Diameter$^3$ | × .5236 | = Volume of sphere |
| Dia. of sphere | × .806 | = Dimensions of equal cube |
| Dia. of sphere | × .6667 | = Length of equal cylinder |
| Area of base | × ⅓ height | = Volume of pyramid or cone |
| Base | × ½ height | = Area of triangle |
| Radius | × 1.1547 | = Side of inscribed cube |
| Sq. ins. | × 1.2732 | = Circular inches |
| Sq. ins. | × .00695 | = Sq. ft. |
| Sq. ft. | × .111 | = Sq. yd. |
| Sq. yds. | × .0002066 | = Acres |
| Cu. in. | × .00058 | = Cu. ft. |
| Cu. ft. | × .03704 | = Cu. yd. |
| Cu. in. | × .004329 | = U. S. gal. |
| Cu. ft. | × 7.4805 | = U. S. gal. |
| Cu. in. | × .000466 | = U. S. bu. |
| Cu. ft. | × .8036 | = U. S. bu. |
| U. S. bu. | × 2150.42 | = Cu. in. |
| U. S. bu. | × 1.242 | = Cu. ft. |
| U. S. bu. | × .046 | = Cu. yd. |
| U. S. gal. | × 231. | = Cu. in. |
| U. S. gal. | × .13368 | = Cu. ft. |
| Cu. in. water | × .36127 | = Pounds (avoirdupois) |
| Cu. ft. water | × 62.4283 | = Pounds (avoirdupois) |
| U. S. gals. water | ÷ 268.8 | = Tons |
| Column of water 1" dia. x 12" high | | = .34 lb. (avoirdupois) |
| Cu. in. | × .263 | = Lb. Av. Cast Iron |
| Cu. in. | × .281 | = Lb. Av. Wrought Iron |
| Cu. in. | × .283 | = Lb. Av. Cast Steel |
| Cu. in. | × .3225 | = Lb. Av. Copper |
| Cu. in. | × .3037 | = Lb. Av. Brass |
| Cu. in. | × .26 | = Lb. Av. Zinc |
| Cu. in. | × .4103 | = Lb. Av. Lead |
| Cu. in. | × .2636 | = Lb. Av. Tin |
| Cu. in. | × .4908 | = Lb. Av. Mercury |
| 12 × weight of pine pattern | | = Iron casting |
| 13 × weight of pine pattern | | = Brass casting |
| 14 × weight of pine pattern | | = Lead casting |

# Standard Data

| | | |
|---|---|---|
| 1 Calorie | = | 3.968 B. t. u. |
| 1 B. t. u. | = | 0.252 Calorie |
| 1 lb. per sq. in. | = | 703.08 kilogrammes per $m^2$ |
| 1 Kilogramme per $m^2$ | = | 0.00142 lbs. per sq. in. |
| 1 Calorie per $m^2$ | = | 0.3687 B. t. u. per sq. ft |
| 1 B. t. u. per sq. ft. | = | 2.712 calories per $m^2$ |
| 1 Calorie per $m^2$ per deg difference cent. | = | 0.2048 B. t. u. per sq. ft, per deg. difference fahr. |
| 1 B. t. u. per sq. ft. per deg. difference fahr. | = | 4.882 Calories per $m^2$ per deg. difference cent. |
| 1 B. t. u. per lb. | = | 0.556 Calories per kilog. |
| 1 Calorie per kilog. | = | 1.8 B. t. u. per lb. |
| 1 Litre of Coke at 26.3 lb. per cu. ft. | = | 0.93 lbs. |
| 1 lb. of Coke at 26.3 lb. per cu. ft. | = | 1.076 litres. |
| Water expands in bulk from 40 deg. to 212 deg. | = | One twenty-third. |

A cubic inch of water evaporated under ordinary atmospheric pressure is converted into 1 cubic foot of steam (approximately).

## Weights

| | | |
|---|---|---|
| 1 cu. in. of Cast Iron | weighs | 0.260 lb. |
| 1 cu. in. of Wrought Iron | weighs | 0.280 lb. |
| 1 cu. in. of Water | weighs | 0.036 lb. |
| 1 U. S. gal. | weighs | 8.330 lb. |
| 1 Imperial gal. | weighs | 10.. lb. |
| 1 U. S. gal. | equals | 231. cu. in. |
| 1 Imperial gal. | equals | 277.274 cu. in. |
| 1 cu. ft. of Water | equals | 7.480 U. S. gal. |
| 1 lb. of Steam | equals | 27.222 cu. ft. |
| 1 lb. of Air. | equals | 13.817 cu. ft. |

## Weights and Measures

### SURVEYORS MEASURE

| | | | |
|---|---|---|---|
| 7.92 in. | 1 link | | |
| 25 links | 1 rod | 4 rods | 1 chain |
| 10 sq. chains or 160 sq. rods | 1 acre | | |
| 640 acres | 1 sq. mile | | |
| 36 sq. miles (6 miles sq.) | 1 township | | |

### CUBIC MEASURE

| | | | |
|---|---|---|---|
| 1728 cu. in. | 1 cu. ft. | 128 cu. ft. | 1 cord (wood) |
| 27 cu. ft. | 1 cu. yd. | 40 c. f. | 1 ton (shpg) |
| 2150.42 cu. in. | 1 standard bu. | | |
| 231 cu. in. | 1 U. S. standard gal. | | |
| 1 cu. ft. | about 4/5 of a bu. | | |

### METRIC EQUIVALENTS—LINEAR MEASURE

| | | | |
|---|---|---|---|
| 1 centimeter | 0.3937 in. | 1 in. | 2.54 centimeters |
| 1 decimeter | 3.937 in. | | 0.328 ft. |
| 1 ft. | | | 3.048 decimeters |
| 1 meter | 39.37 in. | | 1.0936 yards |
| 1 yd. | | | 0.9144 meter |
| 1 dekameter | 1.9884 rods | 1 rd. | 0.5029 dekameter |
| 1 kilometer | 0.62137 m. | 1 m. | 1.6093 kilometers |

# Standard Data

## Metric and English Measures

### MEASURES OF LENGTH

| | Metric | | | English |
|---|---|---|---|---|
| 1 | metre | = | 39.37<br>3.28 | in.<br>ft. |
| .3048 | metre | = | 1 | ft. |
| 1 | centimetre | = | .3937 | in. |
| 2.54 | centimetres | = | 1 | in. |
| 1 | millimetre | = | .03937 | in. (1/25 in., nearly) |
| 25.4 | millimetres | = | 1 | in. |
| 1 | kilometre | = | 1093.61 | yds. |

### MEASURES OF SURFACE

| | | | | |
|---|---|---|---|---|
| 1 | sq. metre | = | 10.764 | sq. ft. |
| .0929 | sq. metre | = | 1 | sq. ft. |
| 1 | sq. centimetre | = | .155 | sq. in. |
| 6.452 | sq. centimetres | = | 1 | sq. in. |
| 1 | sq. millimetre | = | .00155 | sq. in. |
| 645.2 | sq. millimetres | = | 1 | sq. in. |

### MEASURES OF VOLUME

| | | | | |
|---|---|---|---|---|
| 1 | cu. metre | = | 35.314 | cu. ft. |
| .02832 | cu. metre | = | 1 | cu. ft. |
| 1 | cu. decimetre | = | 61.023<br>.0353 | cu. in.<br>cu. ft. |
| 28.32 | cu. decimetres | = | 1 | cu.ft. |
| 16.387 | cu. centimetres | = | 1 | cu. in. |
| 1 | cu. centimetre | = | 1<br>.061 | millimetre<br>cu. in. |

### MEASURES OF CAPACITY

| | | | | |
|---|---|---|---|---|
| 1 | litre = 1 cu. decimetre | = | 61.023<br>.0353<br>.2202<br>2.202 | cu. in.<br>cu. ft.<br>gal. (Imperial)<br>lb. of water at 62 deg. fahr. |
| 28.317 | litres | = | 1 | cu. ft. (6.25 Imperial gal.) |
| 4.543 | litres | = | 1 | gal. (Imperial) |
| 3.785 | litres | = | 1 | gal. (American) |

### MEASURES OF WEIGHT

| | Metric | | | English |
|---|---|---|---|---|
| 28.35 | grammes | = | 1 | oz. avoirdupois |
| 1 | kilogramme | = | 2.2046 | lb. |
| .4536 | kilogramme | = | 1 | lb. |
| 1<br>1000 | metric ton<br>kilogrammes | = | .9842<br>19.68 | ton of 2240 lb., or<br>cwts. or 2204.6 lb. |
| 1.016<br>1016 | metric tons<br>kilogrammes | = | | 1 ton of 2240 lb. |

### MISCELLANEOUS

| | | | | |
|---|---|---|---|---|
| 1 | gramme per sq. millimetre | = | 1.422 | lb. per sq. in. |
| 1 | kilogramme per sq. millimetre | = | 1422.32 | lb. per sq. in. |
| 1 | kilogramme per sq. centimetre | = | 14.233 | lb. per sq. in. |
| 1.0335 | kg. per sq. centimetre<br>1 atmosphere | = | 14.7 | lb. per sq. in. |
| 0.070308 | kilogramme per sq. centimetre | = | 1 | lb. per sq. in. |

# Standard Data

### MEASURES OF PRESSURE AND WEIGHT

| | | | |
|---|---|---|---|
| 1 lb. per sq. in. | = | 144 | lb. per sq. ft. |
| | | 2.0355 | in. of mercury at 32 deg fahr. |
| | | 2.0416 | in. of mercury at 62 deg. fahr. |
| | | 2.309 | ft. of water at 62 deg. fahr. |
| | | 27.71 | in. of water at 62 deg fahr. |
| 1 Atmosphere (14.7 lb. per sq. in.) | = | 2116.3 | lb. per sq. ft. |
| | | 33.947 | ft. of water at 62 deg. fahr. |
| | | 30 | in. of mercury at 62 deg. fahr. |
| | | 29.922 | in. of mercury at 32 deg. fahr. |
| | | 760 | millimetres of mercury at 32 deg. fahr. |
| 1 ft. of Water at 62 deg. fahr. | = | 0.433 | lb. per sq. in. |
| | | 62.355 | lb. per sq. ft. |
| 1 in. of Mercunry at 62 deg. fahr. | = | 0.491 | lb. or 7.86 oz. per sq. in. |
| | | 1.132 | ft. of water at 62 deg. fahr. |
| | | 13.58 | in. of water at 62 deg. fahr. |

### WEIGHT OF ONE CUBIC FOOT OF PURE WATER

| | |
|---|---|
| At 32 deg. fahr. (freezing point) | 62.418 lb. |
| At 39.1 deg. fahr. (maximum density) | 62.425 lb. |
| At 62 deg. fahr. (standard temperature) | 62.355 lb. |
| At 212 deg. fahr. (boiling point, under 1 atmosphere) | 59.76 lb. |
| Imperial gal. = 277.274 cu. in. of water at 62 deg fahr. = | 10 lb. |
| American gal. = 231 cu. in. of water at 62 deg. fahr. = | 8.3356 lb. |

### BOILING POINTS OF VARIOUS FLUIDS

| | Degrees Fahr. | | Degrees Fahr. |
|---|---|---|---|
| Water, Atmospheric Pressure | 212 | Refined Petroleum | 316 |
| Alcohol | 173 | Turpentine | 315 |
| Sulphuric Acid | 240 | Sulphur | 570 |
| | | Linseed Oil | 597 |

### MELTING POINTS OF DIFFERENT METALS

| | Degrees Fahr. | | Degrees Fahr. |
|---|---|---|---|
| Aluminum | 1400 | Iron (cast) | 2450 |
| Antimony | 810 | Iron (wrought) | 2912 |
| Bismuth | 476 | Lead | 608 |
| Brass | 1900 | Platinum | 3080 |
| Bronze | 1692 | Silver (pure) | 1873 |
| Copper | 1996 | Steel | 2500 |
| Glass | 2377 | Tin | 446 |
| Gold (pure) | 2590 | Zinc | 680 |

# Standard Data

## SQUARE MEASURE

| | | | |
|---|---|---|---|
| 1 sq. centimeter | 0.1550 sq. in. | 1 sq. in. | 6.452 sq. centimeters |
| 1 sq. decimeter | 0.1076 sq. ft. | 1 sq. ft. | 9.2903 sq. decimeters |
| 1 sq. meter | 1.196 sq. yd. | 1 sq. yd. | 0.8361 sq. m'r |
| 1 are | 3.954 sq. rods | 1 sq. rd. | 0.2529 are |
| 1 hectare | 2.47 acres | 1 acre | 0.4047 hectare |
| 1 sq. kilometer | 0.386 sq. m. | 1 sq. m. | 2.59 sq. kilometers |

## WEIGHTS

| | | | |
|---|---|---|---|
| 1 gram | 0.03527 ounce | 1 oz. | 28.35 grams |
| 1 kilogram | 2.2046 lbs. | 1 lb. | 0.4536 kilogram |
| 1 metric ton | 1.1023 English tons | 1 English ton | 0.9072 metric ton |

## APPROXIMATE METRIC EQUIVALENTS

| | | | |
|---|---|---|---|
| 1 decimeter | 4 in. | 1 liter | 1.06 qts. liquid |
| 1 meter | 1.1 yds. | | 0.9 qt. dry |
| 1 kilometer | ⅝ of a mile | 1 hektoliter | 2½ bu. |
| 1 hectare | 2½ acres | 1 kilogram | $2\frac{1}{5}$ lb. |
| 1 stere, or cu. meter | ¼ of a cord | 1 metric ton | 2,200 lb. |

## TROY WEIGHT

| | | | |
|---|---|---|---|
| 24 grains | 1 pwt. | | |
| 20 pwt. | 1 oz. | 12 oz. | 1 lb. |

Used for weighing gold, silver and jewels.

## APOTHECARIES WEIGHT

| | | | |
|---|---|---|---|
| 20 grains | 1 scruple | 8 drams | 1 oz. |
| 3 scruples | 1 dram | 12 oz. | 1 lb. |

Ounce and pound are the same as in Troy Weight.

## AVOIRDUPOIS WEIGHT

| | | | |
|---|---|---|---|
| $27\frac{11}{32}$ grains | 1 dram | 4 quarters | 1 cwt. |
| 16 drams | 1 oz. | 2,000 lb. | 1 short ton |
| 16 oz. | 1 lb. | 2,240 lb. | 1 long ton |
| 25 lb. | 1 quarter | | |

## DRY MEASURE

| | | | |
|---|---|---|---|
| 2 pints | 1 qt. | 4 pecks | 1 bu. |
| 8 qts. | 1 peck | 36 bushels | 1 chaldron |

## LIQUID MEASURE

| | | | |
|---|---|---|---|
| 4 gills | 1 pt. | 31½ gals. | 1 bbl. |
| 2 pts. | 1 qt. | 2 barrels | 1 hogshead |
| 4 qts. | 1 gal. | | |

## LONG MEASURE

| | | | |
|---|---|---|---|
| 12 in. | 1 ft. | 40 rods | 1 furlong |
| 3 ft. | 1 yd. | 8 furlongs | 1 sta. mile |
| 5½ yds. | 1 rod | 3 miles | 1 league |

## CLOTH MEASURE

| | | | |
|---|---|---|---|
| 2¼ in. | 1 nail | 4 quarters | 1 yard |
| 4 nails | 1 quarter | | |

## SQUARE MEASURE

| | | | |
|---|---|---|---|
| 144 sq. in. | 1 sq. ft. | 40 sq. rods | 1 rood |
| 9 sq. ft. | 1 sq. yard | 4 roods | 1 acre |
| 30¼ sq. yd. | 1 sq. rod | 640 acres | 1 sq. mile |

# Standard Data

## Circumference and Areas of Circles

| Dia. | Circum-ference | Area | Dia. | Circum-ference | Area | Dia. | Circum-ference | Area. |
|---|---|---|---|---|---|---|---|---|
| ⅛ | .3927 | 0.0123 | 16 | 50.265 | 201.06 | 54 | 169.646 | 2290.2 |
| ¼ | 7854 | 0.0491 | ½ | 51.836 | 213.82 | 55 | 172.788 | 2375.8 |
| ⅜ | 1.1781 | 0.1104 | 17 | 53.407 | 226.98 | 56 | 175.929 | 2463.0 |
| ½ | 1.5708 | 0.1963 | ½ | 54.978 | 240.52 | 57 | 179.071 | 2551.7 |
| ⅝ | 1.9635 | 0.3067 | 18 | 56.549 | 254.46 | 58 | 182.212 | 2642.0 |
| ¾ | 2.3562 | 0.4417 | ½ | 58.119 | 268.80 | 59 | 185.354 | 2733.9 |
| ⅞ | 2.7489 | 0.6013 | 19 | 59.690 | 283.52 | 60 | 188.496 | 2827.4 |
| 1 | 3.1416 | 0.7854 | ½ | 61.261 | 298.64 | 61 | 191.637 | 2922.4 |
| ⅛ | 3.5343 | 0.9940 | 20 | 62.832 | 314.16 | 62 | 194.779 | 3019.0 |
| ¼ | 3.9270 | 1.227 | ½ | 64.403 | 330.06 | 63 | 197.920 | 3117.2 |
| ⅜ | 4.3197 | 1.484 | 21 | 65.973 | 346.36 | 64 | 201.062 | 3216.9 |
| ½ | 4.7124 | 1.767 | ½ | 67.544 | 363.05 | 65 | 204.204 | 3318.3 |
| ⅝ | 5.1051 | 2.073 | 22 | 69.115 | 380.13 | 66 | 207.345 | 3421.2 |
| ¾ | 5.4978 | 2.405 | ½ | 70.686 | 397.60 | 67 | 210.487 | 3525.6 |
| ⅞ | 5.8905 | 2.761 | 23 | 72.257 | 415.47 | 68 | 213.628 | 3631.6 |
| 2 | 6.2832 | 3.141 | ½ | 73.827 | 433.73 | 69 | 216.770 | 3739.2 |
| ¼ | 7.0686 | 3.976 | 24 | 75.398 | 452.39 | 70 | 219.911 | 3848.4 |
| ½ | 7.8540 | 4.908 | ½ | 76.969 | 471.43 | 71 | 223.053 | 3959.2 |
| ¾ | 8.6394 | 5.939 | 25 | 78.540 | 490.87 | 72 | 226.195 | 4071.5 |
| 3 | 9.4248 | 7.068 | 26 | 81.681 | 530.93 | 73 | 229.336 | 4185.3 |
| ¼ | 10.210 | 8.295 | 27 | 84.823 | 572.55 | 74 | 232.478 | 4300.8 |
| ½ | 10.996 | 9.621 | 28 | 87.965 | 615.75 | 75 | 235.619 | 4417.8 |
| ¾ | 11.781 | 11.044 | 29 | 91.106 | 660.52 | 76 | 238.761 | 4536.4 |
| 4 | 12.566 | 12.566 | 30 | 94.248 | 706.86 | 77 | 241.903 | 4656.0 |
| ½ | 14.137 | 15.904 | 31 | 97.389 | 754.76 | 78 | 245.044 | 4778.3 |
| 5 | 15.708 | 19.635 | 32 | 100.531 | 804.24 | 79 | 248.186 | 4901.6 |
| ½ | 17.279 | 23.758 | 33 | 103.673 | 855.30 | 80 | 251.327 | 5026.5 |
| 6 | 18.850 | 28.274 | 34 | 106.814 | 907.92 | 81 | 254.469 | 5153.0 |
| ½ | 20.420 | 33.183 | 35 | 109.956 | 962.11 | 82 | 257.611 | 5281.0 |
| 7 | 21.991 | 38.484 | 36 | 113.097 | 1017.8 | 83 | 260.752 | 5410.6 |
| ½ | 23.562 | 44.178 | 37 | 116.239 | 1075.2 | 84 | 263.894 | 5541.7 |
| 8 | 25.133 | 50.265 | 38 | 119.381 | 1134.1 | 85 | 267.035 | 5674.5 |
| ½ | 26.704 | 56.745 | 39 | 122.522 | 1194.5 | 86 | 270.177 | 5808.8 |
| 9 | 28.274 | 63.617 | 40 | 125.664 | 1256.6 | 87 | 273.319 | 5944.6 |
| ½ | 29.845 | 70.882 | 41 | 128.805 | 1320.2 | 88 | 276.460 | 6082.1 |
| 10 | 31.416 | 78.54 | 42 | 131.947 | 1385.4 | 89 | 279.602 | 6221.1 |
| ½ | 32.987 | 86.59 | 43 | 135.088 | 1452.2 | 90 | 282.743 | 6361.7 |
| 11 | 34.558 | 95.03 | 44 | 138.230 | 1520.5 | 91 | 285.885 | 6503.8 |
| ½ | 36.128 | 103.86 | 45 | 141.372 | 1590.4 | 92 | 289.027 | 6647.6 |
| 12 | 37.699 | 113.09 | 46 | 144.513 | 1661.9 | 93 | 292.168 | 6792.9 |
| ½ | 39.270 | 122.71 | 47 | 147.655 | 1734.9 | 94 | 295.310 | 6939.7 |
| 13 | 40.841 | 132.73 | 48 | 150.796 | 1809.5 | 95 | 298.451 | 7088.2 |
| ½ | 42.412 | 143.13 | 49 | 153.938 | 1885.7 | 96 | 301.593 | 7238.2 |
| 14 | 43.982 | 153.93 | 50 | 157.080 | 1963.5 | 97 | 304.734 | 7389.8 |
| ½ | 45.553 | 165.13 | 51 | 160.221 | 2042.8 | 98 | 307.876 | 7542.9 |
| 15 | 47.124 | 176.71 | 52 | 163.363 | 2123.7 | 99 | 311.018 | 7697.7 |
| ½ | 48.695 | 188.69 | 53 | 166.504 | 2206.1 |  |  |  |

# Standard Data

## SPECIFIC HEAT OF BODIES

| Material | Specific Heat | Material | Specific Heat | Material | Specific Heat |
|---|---|---|---|---|---|
| Cast Iron | 0.12983 | Gold | 0.03244 | Glass | 0.19768 |
| Wrought Iron | 0.11379 | Platinum | 0.03243 | Burnt Clay | 0.18500 |
| Lime | 0.09555 | Lead | 0.03140 | Brickwood | 0.20000 |
| Copper | 0.09515 | Bismuth | 0.03084 | Water at 32° | 1.00000 |
| Brass | 0.09391 | Nickel | 0.10860 | Alcohol (S.G.793) | 0.62200 |
| Silver | 0.05701 | Ice | 0.50400 | Petroleum | 0.43400 |
| Tin | 0.05695 | Coal | 0.27770 | Olive Oil | 0.30960 |
| Mercury | 0.03332 | Coke | 0.20085 | Air | 0.2415* |

## SPECIFIC GRAVITY OF BODIES

| Body | Specific Gravity | Weight per Cu Ft. in Lb. |
|---|---|---|
| Water | 1.00 | 62.5 |
| Aluminum | 2.50 | 156.3 |
| Tin (cast) | 7.29 | 455.6 |
| Steel | 7.84 | 490.0 |
| Cast Iron | 7.21 | 450.6 |
| Wrought Iron | 7.68 | 480.0 |
| Brass | 8.38 | 523.8 |
| Copper | 8.79 | 549.4 |
| Lead (cast) | 11.35 | 709.4 |
| Mercury | 13.60 | 850.0 |
| Platinum | 21.50 | 1343.8 |

## DECIMAL EQUIVALENTS OF FRACTIONS

| Fraction | Dec. Equiv. | Fraction | Dec. Equiv. | Fraction | Dec. Equiv. | Fraction | Dec. Equiv. |
|---|---|---|---|---|---|---|---|
| 1-64 | 0.015625 | 17-64 | 0.265625 | 33-64 | 0.515625 | 49-64 | 0.765625 |
| 1-32 | 0.031250 | 9-32 | 0.281250 | 17-32 | 0.531250 | 25-32 | 0.781250 |
| 3-64 | 0.046875 | 19-64 | 0.296875 | 35-64 | 0.546875 | 51-64 | 0.796875 |
| 1-16 | 0.062500 | 5-16 | 0.312500 | 9-16 | 0.562500 | 13-16 | 0.812500 |
| 5-64 | 0.078125 | 21-64 | 0.328125 | 37-64 | 0.578125 | 53-64 | 0.828125 |
| 3-32 | 0.093750 | 11-32 | 0.343750 | 19-32 | 0.593750 | 27-32 | 0.843750 |
| 7-64 | 0.109375 | 23-64 | 0.359375 | 39-64 | 0.609375 | 55-64 | 0.859375 |
| 1-8 | 0.125000 | 3-8 | 0.375000 | 5-8 | 0.625000 | 7-8 | 0.875000 |
| 9-64 | 0.140625 | 25-64 | 0.390625 | 41-64 | 0.640625 | 57-64 | 0.890625 |
| 5-32 | 0.156250 | 13-32 | 0.406250 | 21-32 | 0.656250 | 29-32 | 0.906250 |
| 11-64 | 0.171875 | 27-64 | 0.421875 | 43-64 | 0.671875 | 59-64 | 0.921875 |
| 3-16 | 0.187500 | 7-16 | 0.437500 | 11-16 | 0.687500 | 15-16 | 0.937500 |
| 13-64 | 0.203125 | 29-64 | 0.453125 | 45-64 | 0.703125 | 61-64 | 0.953125 |
| 7-32 | 0.218750 | 15-32 | 0.468750 | 23-32 | 0.718750 | 31-32 | 0.968750 |
| 15-64 | 0.234375 | 31-64 | 0.484375 | 47-64 | 0.734375 | 63-64 | 0.984375 |
| 1-4 | 0.250000 | 1-2 | 0.500000 | 3-4 | 0.750000 | 1- | 1.000000 |

# Comparison of Temperatures

## Standard Data

CENT. = 0.55 x (FAHR − 32)     FAHR = (1.8 x CENT) + 32

| CENT. | FAHR | C | F | C | F | C | F | C | F | C | F | C | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 32 | 230 | 446 | 460 | 860 | 690 | 1274 | 920 | 1688 | 1150 | 2102 | 1380 | 2516 |
| 5 | 41 | 235 | 455 | 465 | 869 | 695 | 1283 | 925 | 1697 | 1155 | 2111 | 1385 | 2525 |
| 10 | 50 | 240 | 464 | 470 | 878 | 700 | 1292 | 930 | 1706 | 1160 | 2120 | 1390 | 2534 |
| 15 | 59 | 245 | 473 | 475 | 887 | 705 | 1301 | 935 | 1715 | 1165 | 2129 | 1395 | 2543 |
| 20 | 68 | 250 | 482 | 480 | 896 | 710 | 1310 | 940 | 1724 | 1170 | 2138 | 1400 | 2552 |
| 25 | 77 | 255 | 491 | 485 | 905 | 715 | 1319 | 945 | 1733 | 1175 | 2147 | 1405 | 2561 |
| 30 | 86 | 260 | 500 | 490 | 914 | 720 | 1328 | 950 | 1742 | 1180 | 2156 | 1410 | 2570 |
| 35 | 95 | 265 | 509 | 495 | 923 | 725 | 1337 | 955 | 1751 | 1185 | 2165 | 1415 | 2579 |
| 40 | 104 | 270 | 518 | 500 | 932 | 730 | 1346 | 960 | 1760 | 1190 | 2174 | 1420 | 2588 |
| 45 | 113 | 275 | 527 | 505 | 941 | 735 | 1355 | 965 | 1769 | 1195 | 2183 | 1425 | 2597 |
| 50 | 122 | 280 | 536 | 510 | 950 | 740 | 1364 | 970 | 1778 | 1200 | 2192 | 1430 | 2606 |
| 55 | 131 | 285 | 545 | 515 | 959 | 745 | 1373 | 975 | 1787 | 1205 | 2201 | 1435 | 2615 |
| 60 | 140 | 290 | 554 | 520 | 968 | 750 | 1382 | 980 | 1796 | 1210 | 2210 | 1440 | 2624 |
| 65 | 149 | 295 | 563 | 525 | 977 | 755 | 1391 | 985 | 1805 | 1215 | 2219 | 1445 | 2633 |
| 70 | 158 | 300 | 572 | 530 | 986 | 760 | 1400 | 990 | 1814 | 1220 | 2228 | 1450 | 2642 |
| 75 | 167 | 305 | 581 | 535 | 995 | 765 | 1409 | 995 | 1823 | 1225 | 2237 | 1455 | 2651 |
| 80 | 176 | 310 | 590 | 540 | 1004 | 770 | 1418 | 1000 | 1832 | 1230 | 2246 | 1460 | 2660 |
| 85 | 185 | 315 | 599 | 545 | 1013 | 775 | 1427 | 1005 | 1841 | 1235 | 2255 | 1465 | 2669 |
| 90 | 194 | 320 | 608 | 550 | 1022 | 780 | 1436 | 1010 | 1850 | 1240 | 2264 | 1470 | 2678 |
| 95 | 203 | 325 | 617 | 555 | 1031 | 785 | 1445 | 1015 | 1859 | 1245 | 2273 | 1475 | 2687 |
| 100 | 212 | 330 | 626 | 560 | 1040 | 790 | 1454 | 1020 | 1868 | 1250 | 2282 | 1980 | 2696 |
| 105 | 221 | 335 | 635 | 565 | 1049 | 795 | 1463 | 1025 | 1877 | 1255 | 2291 | 1485 | 2705 |
| 110 | 230 | 340 | 644 | 570 | 1058 | 800 | 1472 | 1030 | 1886 | 1260 | 2300 | 1490 | 2714 |
| 115 | 239 | 345 | 653 | 575 | 1067 | 805 | 1481 | 1035 | 1895 | 1265 | 2309 | 1495 | 2723 |
| 120 | 248 | 350 | 662 | 580 | 1076 | 810 | 1490 | 1040 | 1904 | 1270 | 2318 | 1500 | 2732 |
| 125 | 257 | 355 | 671 | 585 | 1085 | 815 | 1499 | 1045 | 1913 | 1275 | 2327 | 1505 | 2741 |
| 130 | 266 | 360 | 680 | 590 | 1094 | 820 | 1508 | 1050 | 1922 | 1280 | 2336 | 1510 | 2750 |
| 135 | 275 | 365 | 689 | 595 | 1103 | 825 | 1517 | 1055 | 1931 | 1285 | 2345 | 1515 | 2759 |
| 140 | 284 | 370 | 698 | 600 | 1112 | 830 | 1526 | 1060 | 1940 | 1290 | 2354 | 1520 | 2768 |
| 145 | 293 | 375 | 707 | 605 | 1121 | 835 | 1535 | 1065 | 1949 | 1295 | 2363 | 1525 | 2777 |
| 150 | 302 | 380 | 716 | 610 | 1130 | 840 | 1544 | 1070 | 1958 | 1300 | 2372 | 1530 | 2786 |
| 155 | 311 | 385 | 725 | 615 | 1139 | 845 | 1553 | 1075 | 1967 | 1405 | 2381 | 1535 | 2795 |
| 160 | 320 | 390 | 734 | 620 | 1148 | 850 | 1562 | 1080 | 1976 | 1310 | 2390 | 1540 | 2804 |
| 165 | 329 | 395 | 743 | 625 | 1157 | 855 | 1571 | 1085 | 1985 | 1315 | 2399 | 1545 | 2813 |
| 170 | 338 | 400 | 752 | 630 | 1166 | 860 | 1580 | 1090 | 1994 | 1320 | 2408 | 1550 | 2822 |
| 175 | 347 | 405 | 761 | 635 | 1175 | 865 | 1589 | 1095 | 2003 | 1325 | 2417 | 1555 | 2831 |
| 180 | 356 | 410 | 770 | 640 | 1184 | 870 | 1598 | 1100 | 2012 | 1330 | 2426 | 1560 | 2840 |
| 185 | 365 | 415 | 779 | 645 | 1193 | 875 | 1607 | 1105 | 2021 | 1335 | 2435 | 1565 | 2849 |
| 190 | 374 | 420 | 788 | 650 | 1202 | 880 | 1616 | 1110 | 2030 | 1340 | 2444 | 1570 | 2858 |
| 195 | 383 | 425 | 797 | 655 | 1211 | 885 | 1625 | 1115 | 2039 | 1345 | 2453 | 1575 | 2867 |
| 200 | 392 | 430 | 806 | 660 | 1220 | 890 | 1634 | 1120 | 2048 | 1350 | 2462 | 1580 | 2876 |
| 205 | 401 | 435 | 815 | 665 | 1229 | 895 | 1643 | 1125 | 2057 | 1355 | 2471 | 1585 | 2885 |
| 210 | 410 | 440 | 824 | 670 | 1238 | 900 | 1652 | 1130 | 2066 | 1360 | 2480 | 1590 | 2894 |
| 215 | 419 | 445 | 833 | 675 | 1247 | 905 | 1661 | 1135 | 2075 | 1365 | 2489 | 1595 | 2903 |
| 220 | 428 | 450 | 842 | 680 | 1256 | 910 | 1670 | 1140 | 2084 | 1370 | 2498 | 1600 | 2912 |
| 225 | 437 | 455 | 851 | 685 | 1265 | 915 | 1679 | 1145 | 2093 | 1375 | 2507 | | |

# Diameter of Flues Required for the Passage of a Given Volume of Air at Various Standard Velocities

SHEET - 1.

| Cu. Ft. of Air per Minute | 500 | 600 | 700 | 800 | 900 | 1000 | 1200 | 1500 | 1800 | 2000 | 2200 | 2500 | 2800 | 3000 | 3500 | 4000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 9 | 8 | 8 | 7 | 7 | 7 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| 300 | 11 | 10 | 9 | 9 | 8 | 8 | 7 | 7 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| 400 | 13 | 11 | 11 | 10 | 9 | 9 | 8 | 8 | 7 | 7 | 6 | 6 | 6 | 6 | 6 | 6 |
| 500 | 14 | 13 | 12 | 11 | 11 | 10 | 9 | 8 | 8 | 7 | 7 | 7 | 6 | 6 | 6 | 6 |
| 600 | 15 | 14 | 13 | 12 | 11 | 11 | 10 | 9 | 8 | 8 | 8 | 7 | 7 | 7 | 6 | 6 |
| 700 | 16 | 15 | 14 | 13 | 12 | 12 | 11 | 10 | 9 | 9 | 8 | 8 | 7 | 7 | 7 | 6 |
| 800 | 18 | 16 | 15 | 14 | 13 | 13 | 12 | 10 | 9 | 9 | 9 | 8 | 8 | 8 | 7 | 7 |
| 900 | 19 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 10 | 9 | 9 | 8 | 8 | 8 | 7 |
| 1000 | 20 | 18 | 16 | 16 | 15 | 14 | 13 | 12 | 10 | 10 | 10 | 9 | 9 | 8 | 8 | 7 |
| 1100 | 21 | 19 | 18 | 16 | 16 | 15 | 13 | 12 | 11 | 11 | 10 | 9 | 9 | 9 | 8 | 8 |
| 1200 | 21 | 20 | 18 | 17 | 16 | 15 | 14 | 13 | 11 | 11 | 10 | 10 | 9 | 9 | 9 | 8 |
| 1300 | 22 | 20 | 19 | 18 | 17 | 16 | 15 | 13 | 12 | 11 | 11 | 10 | 10 | 10 | 9 | 8 |
| 1400 | 23 | 21 | 20 | 18 | 17 | 16 | 15 | 14 | 12 | 12 | 11 | 11 | 10 | 10 | 9 | 9 |
| 1500 | 24 | 22 | 20 | 19 | 18 | 17 | 16 | 14 | 13 | 12 | 12 | 11 | 10 | 10 | 9 | 9 |
| 1600 | 25 | 23 | 21 | 20 | 18 | 18 | 16 | 15 | 13 | 13 | 12 | 11 | 11 | 11 | 10 | 9 |
| 1700 | 25 | 24 | 21 | 20 | 19 | 18 | 17 | 15 | 14 | 13 | 12 | 12 | 11 | 11 | 10 | 9 |
| 1800 | 26 | 24 | 22 | 21 | 20 | 19 | 17 | 15 | 14 | 13 | 13 | 12 | 11 | 11 | 10 | 10 |
| 1900 | 27 | 24 | 23 | 21 | 20 | 19 | 18 | 16 | 14 | 14 | 13 | 12 | 12 | 11 | 10 | 10 |
| 2000 | 28 | 25 | 23 | 22 | 21 | 20 | 18 | 16 | 15 | 14 | 13 | 13 | 12 | 12 | 11 | 10 |
| 2100 | 28 | 26 | 24 | 22 | 21 | 20 | 18 | 16 | 15 | 14 | 14 | 13 | 12 | 12 | 11 | 10 |
| 2200 | 29 | 27 | 24 | 23 | 22 | 21 | 19 | 17 | 15 | 15 | 14 | 13 | 12 | 12 | 11 | 11 |
| 2300 | 30 | 27 | 25 | 23 | 22 | 21 | 19 | 17 | 16 | 15 | 15 | 13 | 13 | 12 | 11 | 11 |
| 2400 | 30 | 28 | 25 | 24 | 23 | 21 | 20 | 18 | 16 | 15 | 15 | 14 | 13 | 13 | 12 | 11 |
| 2500 | 31 | 28 | 26 | 24 | 23 | 22 | 20 | 18 | 16 | 16 | 15 | 14 | 13 | 13 | 12 | 11 |
| 2600 | 31 | 29 | 27 | 25 | 23 | 22 | 20 | 18 | 17 | 16 | 15 | 15 | 14 | 13 | 12 | 11 |
| 2700 | 32 | 29 | 27 | 25 | 24 | 23 | 21 | 19 | 17 | 16 | 15 | 15 | 14 | 13 | 12 | 12 |
| 2800 | 33 | 30 | 28 | 26 | 24 | 23 | 21 | 19 | 18 | 16 | 16 | 15 | 14 | 14 | 13 | 12 |
| 2900 | 33 | 30 | 28 | 26 | 25 | 24 | 22 | 19 | 18 | 17 | 16 | 15 | 14 | 14 | 13 | 12 |
| 3000 | 34 | 31 | 29 | 27 | 25 | 24 | 22 | 20 | 18 | 17 | 16 | 15 | 15 | 14 | 13 | 12 |
| 3100 | 34 | 31 | 29 | 27 | 26 | 24 | 22 | 20 | 18 | 17 | 17 | 15 | 15 | 14 | 13 | 12 |
| 3200 | 34 | 32 | 30 | 28 | 26 | 25 | 23 | 20 | 19 | 18 | 17 | 15 | 15 | 15 | 13 | 13 |
| 3300 | 35 | 32 | 30 | 28 | 26 | 25 | 23 | 21 | 19 | 18 | 17 | 16 | 15 | 15 | 14 | 13 |
| 3400 | 36 | 33 | 30 | 28 | 27 | 25 | 23 | 21 | 19 | 18 | 17 | 16 | 15 | 15 | 14 | 13 |
| 3500 | 36 | 33 | 31 | 29 | 27 | 26 | 24 | 21 | 19 | 18 | 18 | 16 | 16 | 15 | 15 | 14 |
| 3600 | 37 | 34 | 31 | 29 | 28 | 26 | 24 | 21 | 20 | 19 | 18 | 16 | 16 | 15 | 15 | 14 |

# Diameter of Flues Required for the Passage of a Given Volume of Air at Various Standard Velocities

SHEET-2

| CU. FT. OF AIR PER MINUTE | 500 | 600 | 700 | 800 | 900 | 1000 | 1200 | 1500 | 1800 | 2000 | 2200 | 2500 | 2800 | 3000 | 3500 | 4000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3700 | 37 | 34 | 32 | 30 | 28 | 27 | 24 | 22 | 20 | 19 | 18 | 17 | 16 | 16 | 14 | 14 |
| 3800 | 38 | 35 | 32 | 30 | 28 | 27 | 25 | 22 | 21 | 19 | 18 | 17 | 16 | 16 | 15 | 14 |
| 3900 | 38 | 35 | 32 | 30 | 29 | 27 | 25 | 22 | 21 | 19 | 19 | 17 | 16 | 16 | 15 | 14 |
| 4000 | 39 | 35 | 33 | 31 | 29 | 28 | 25 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 4100 | 39 | 36 | 33 | 31 | 29 | 28 | 26 | 23 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 4200 | 40 | 36 | 34 | 32 | 30 | 28 | 26 | 23 | 21 | 20 | 19 | 18 | 17 | 16 | 15 | 14 |
| 4300 | 40 | 37 | 34 | 32 | 30 | 29 | 26 | 23 | 21 | 20 | 19 | 18 | 17 | 17 | 15 | 15 |
| 4400 | 41 | 37 | 34 | 32 | 30 | 29 | 26 | 24 | 22 | 21 | 20 | 18 | 17 | 17 | 16 | 15 |
| 4500 | 41 | 38 | 35 | 33 | 31 | 29 | 27 | 24 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 |
| 4600 | 42 | 38 | 35 | 33 | 31 | 30 | 27 | 24 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 |
| 4700 | 42 | 38 | 36 | 34 | 31 | 30 | 27 | 24 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 |
| 4800 | 42 | 39 | 36 | 34 | 32 | 30 | 28 | 25 | 22 | 21 | 20 | 19 | 18 | 18 | 16 | 15 |
| 4900 | 43 | 39 | 36 | 34 | 32 | 30 | 28 | 25 | 23 | 22 | 21 | 19 | 18 | 18 | 16 | 16 |
| 5000 | 43 | 40 | 37 | 34 | 32 | 31 | 28 | 25 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 |
| 5100 | 43 | 40 | 37 | 35 | 33 | 31 | 28 | 25 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 |
| 5200 | 44 | 40 | 37 | 35 | 33 | 31 | 29 | 25 | 24 | 22 | 21 | 20 | 19 | 18 | 17 | 16 |
| 5300 | 45 | 41 | 38 | 35 | 33 | 32 | 29 | 26 | 24 | 23 | 22 | 20 | 19 | 18 | 17 | 16 |
| 5400 | 45 | 41 | 38 | 35 | 33 | 32 | 29 | 26 | 24 | 23 | 22 | 21 | 19 | 18 | 18 | 16 |
| 5500 | 45 | 41 | 38 | 36 | 34 | 32 | 29 | 26 | 24 | 23 | 22 | 21 | 19 | 18 | 18 | 16 |
| 5600 | 45 | 41 | 39 | 36 | 34 | 33 | 30 | 27 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 |
| 5700 | 46 | 42 | 39 | 37 | 34 | 33 | 30 | 27 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 |
| 5800 | 46 | 42 | 39 | 37 | 35 | 33 | 30 | 27 | 25 | 24 | 22 | 21 | 20 | 19 | 18 | 17 |
| 5900 | 46 | 42 | 40 | 37 | 36 | 33 | 30 | 27 | 25 | 24 | 22 | 21 | 20 | 19 | 18 | 17 |
| 6000 | 47 | 43 | 40 | 38 | 36 | 34 | 31 | 28 | 25 | 24 | 23 | 21 | 20 | 20 | 18 | 17 |
| 6100 | 47 | 43 | 40 | 38 | 36 | 34 | 31 | 28 | 25 | 24 | 23 | 21 | 20 | 20 | 18 | 17 |
| 6200 | 48 | 43 | 41 | 38 | 36 | 34 | 31 | 28 | 25 | 24 | 23 | 21 | 21 | 20 | 18 | 17 |
| 6300 | 48 | 44 | 41 | 38 | 36 | 34 | 31 | 28 | 25 | 24 | 23 | 22 | 21 | 20 | 18 | 17 |
| 6400 | 48 | 44 | 41 | 39 | 37 | 35 | 32 | 28 | 26 | 25 | 24 | 22 | 21 | 20 | 19 | 18 |
| 6500 | 49 | 44 | 41 | 39 | 37 | 36 | 32 | 29 | 26 | 25 | 24 | 22 | 21 | 20 | 19 | 18 |
| 6600 | 50 | 45 | 42 | 39 | 37 | 36 | 32 | 29 | 26 | 25 | 24 | 22 | 21 | 21 | 19 | 18 |
| 6700 | 50 | 45 | 42 | 40 | 37 | 36 | 32 | 29 | 27 | 25 | 24 | 22 | 21 | 21 | 19 | 18 |
| 6800 | 50 | 46 | 43 | 40 | 38 | 36 | 33 | 29 | 27 | 25 | 24 | 23 | 21 | 21 | 19 | 18 |
| 6900 | 50 | 46 | 43 | 40 | 38 | 36 | 33 | 30 | 27 | 25 | 24 | 23 | 21 | 21 | 19 | 18 |
| 7000 | 51 | 46 | 43 | 40 | 38 | 36 | 33 | 30 | 27 | 26 | 24 | 23 | 22 | 21 | 20 | 19 |
| 7100 | 51 | 46 | 44 | 41 | 38 | 37 | 33 | 30 | 27 | 26 | 25 | 23 | 22 | 21 | 20 | 19 |

# Diameter of Flues Required for the Passage of a Given Volume of Air at Various Standard Velocities

SHEET – 3

| Cu. Ft. of Air per Minute | 500 | 600 | 700 | 800 | 900 | 1000 | 1200 | 1500 | 1800 | 2000 | 2200 | 2500 | 2800 | 3000 | 3500 | 4000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7200 | 52 | 47 | 44 | 41 | 39 | 37 | 34 | 30 | 28 | 26 | 25 | 23 | 22 | 21 | 20 | 19 |
| 7300 | 53 | 47 | 44 | 41 | 39 | 37 | 34 | 30 | 28 | 26 | 25 | 24 | 22 | 21 | 20 | 19 |
| 7400 | 53 | 48 | 44 | 41 | 39 | 37 | 34 | 30 | 28 | 27 | 25 | 24 | 22 | 21 | 20 | 19 |
| 7500 | 53 | 48 | 45 | 42 | 40 | 38 | 34 | 31 | 28 | 27 | 25 | 24 | 22 | 21 | 20 | 19 |
| 7600 | 53 | 48 | 45 | 42 | 40 | 38 | 34 | 31 | 28 | 27 | 25 | 24 | 23 | 22 | 20 | 19 |
| 7700 | 53 | 49 | 45 | 42 | 40 | 38 | 35 | 31 | 28 | 27 | 26 | 24 | 23 | 22 | 21 | 19 |
| 7800 | 54 | 49 | 46 | 43 | 40 | 38 | 36 | 31 | 29 | 27 | 26 | 24 | 23 | 22 | 21 | 19 |
| 7900 | 54 | 49 | 46 | 43 | 40 | 39 | 36 | 31 | 29 | 27 | 26 | 24 | 23 | 22 | 21 | 19 |
| 8000 | 54 | 49 | 46 | 43 | 41 | 39 | 36 | 32 | 29 | 28 | 26 | 25 | 24 | 22 | 21 | 20 |
| 8100 | 55 | 50 | 46 | 43 | 41 | 39 | 36 | 32 | 29 | 28 | 26 | 25 | 24 | 23 | 21 | 20 |
| 8200 | 55 | 50 | 46 | 43 | 41 | 39 | 36 | 32 | 29 | 28 | 27 | 25 | 24 | 23 | 21 | 20 |
| 8300 | 55 | 50 | 47 | 43 | 41 | 40 | 36 | 32 | 30 | 28 | 27 | 25 | 24 | 23 | 21 | 20 |
| 8400 | 56 | 51 | 47 | 44 | 41 | 40 | 36 | 33 | 30 | 28 | 27 | 25 | 24 | 23 | 21 | 20 |
| 8500 | 56 | 51 | 47 | 44 | 41 | 40 | 36 | 33 | 30 | 28 | 27 | 25 | 24 | 23 | 21 | 20 |
| 8600 | 56 | 51 | 48 | 44 | 42 | 40 | 37 | 33 | 30 | 29 | 27 | 25 | 24 | 23 | 21 | 20 |
| 8700 | 56 | 52 | 48 | 45 | 42 | 40 | 37 | 33 | 30 | 29 | 28 | 25 | 24 | 24 | 21 | 20 |
| 8800 | 57 | 52 | 48 | 45 | 42 | 41 | 37 | 33 | 30 | 29 | 28 | 26 | 24 | 24 | 22 | 21 |
| 8900 | 57 | 52 | 48 | 45 | 43 | 41 | 37 | 33 | 30 | 29 | 28 | 26 | 24 | 24 | 22 | 21 |
| 9000 | 57 | 52 | 49 | 45 | 43 | 41 | 38 | 34 | 31 | 29 | 28 | 26 | 25 | 24 | 22 | 21 |
| 9100 | 58 | 53 | 49 | 46 | 43 | 41 | 38 | 34 | 31 | 29 | 28 | 26 | 25 | 24 | 22 | 21 |
| 9200 | 58 | 53 | 49 | 46 | 43 | 41 | 38 | 34 | 31 | 30 | 28 | 26 | 25 | 24 | 22 | 21 |
| 9300 | 58 | 53 | 49 | 46 | 44 | 42 | 38 | 34 | 31 | 30 | 28 | 27 | 25 | 24 | 22 | 21 |
| 9400 | 59 | 53 | 50 | 46 | 44 | 42 | 38 | 34 | 31 | 30 | 28 | 27 | 25 | 24 | 22 | 21 |
| 9500 | 59 | 54 | 50 | 47 | 44 | 42 | 39 | 34 | 31 | 30 | 29 | 27 | 25 | 24 | 23 | 21 |
| 9600 | 59 | 54 | 50 | 47 | 44 | 42 | 39 | 35 | 32 | 30 | 29 | 27 | 25 | 25 | 23 | 21 |
| 9700 | 60 | 54 | 51 | 47 | 45 | 43 | 39 | 35 | 32 | 30 | 29 | 27 | 25 | 25 | 23 | 21 |
| 9800 | 60 | 55 | 51 | 47 | 45 | 43 | 39 | 36 | 32 | 30 | 29 | 27 | 26 | 25 | 23 | 21 |
| 9900 | 60 | 55 | 51 | 48 | 45 | 43 | 39 | 36 | 32 | 30 | 29 | 27 | 26 | 25 | 23 | 21 |
| 10000 | 61 | 55 | 52 | 48 | 45 | 43 | 40 | 36 | 32 | 31 | 29 | 28 | 26 | 25 | 23 | 22 |
| 10500 | 61 | 57 | 53 | 49 | 46 | 44 | 41 | 36 | 32 | 31 | 30 | 28 | 27 | 26 | 24 | 22 |
| 11000 | 62 | 58 | 54 | 40 | 47 | 45 | 41 | 37 | 33 | 31 | 31 | 29 | 27 | 26 | 24 | 23 |
| 11500 | 62 | 59 | 55 | 51 | 48 | 46 | 42 | 37 | 34 | 32 | 31 | 30 | 28 | 27 | 25 | 23 |
| 12000 | 63 | 60 | 56 | 52 | 49 | 47 | 43 | 39 | 35 | 34 | 32 | 30 | 28 | 28 | 25 | 24 |
| 12500 | 64 | 61 | 57 | 53 | 50 | 48 | 44 | 40 | 36 | 34 | 33 | 31 | 30 | 28 | 26 | 24 |
| 13000 | 65 | 62 | 58 | 54 | 51 | 49 | 45 | 40 | 37 | 35 | 33 | 31 | 30 | 29 | 27 | 25 |

# Diameter of Flues Required for the Passage of a Given Volume of Air at Various Standard Velocities

SHEET—4

| CU. FT. OF AIR PER MINUTE | 500 | 600 | 700 | 800 | 900 | 1000 | 1200 | 1500 | 1800 | 2000 | 2200 | 2500 | 2800 | 3000 | 3500 | 4000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13500 | 70 | 64 | 59 | 56 | 52 | 50 | 46 | 41 | 38 | 35 | 34 | 32 | 30 | 29 | 27 | 25 |
| 14000 | 72 | 65 | 61 | 57 | 53 | 51 | 47 | 42 | 38 | 36 | 34 | 33 | 31 | 30 | 28 | 26 |
| 14500 | 73 | 66 | 61 | 57 | 54 | 52 | 47 | 42 | 39 | 37 | 35 | 33 | 31 | 30 | 28 | 26 |
| 15000 | 74 | 68 | 62 | 59 | 56 | 53 | 48 | 43 | 40 | 38 | 36 | 34 | 32 | 31 | 28 | 27 |
| 15500 | 75 | 69 | 64 | 59 | 56 | 54 | 49 | 44 | 40 | 38 | 36 | 35 | 32 | 31 | 29 | 27 |
| 16000 | 77 | 70 | 65 | 60 | 59 | 55 | 50 | 45 | 41 | 39 | 37 | 35 | 33 | 32 | 29 | 28 |
| 16500 | 78 | 71 | 65 | 61 | 58 | 56 | 51 | 45 | 41 | 39 | 38 | 36 | 33 | 32 | 30 | 28 |
| 17000 | 79 | 73 | 66 | 62 | 59 | 56 | 51 | 46 | 42 | 40 | 38 | 36 | 34 | 33 | 30 | 28 |
| 17500 | 80 | 73 | 68 | 64 | 59 | 57 | 52 | 47 | 43 | 40 | 39 | 37 | 34 | 33 | 31 | 29 |
| 18000 | 81 | 74 | 68 | 64 | 60 | 58 | 53 | 47 | 43 | 41 | 39 | 37 | 35 | 34 | 31 | 29 |
| 18500 | 82 | 75 | 70 | 65 | 60 | 59 | 54 | 48 | 44 | 42 | 40 | 38 | 35 | 34 | 31 | 30 |
| 19000 | 83 | 75 | 70 | 65 | 62 | 60 | 54 | 49 | 44 | 42 | 40 | 38 | 35 | 34 | 32 | 30 |
| 19500 | 85 | 77 | 72 | 62 | 62 | 60 | 55 | 49 | 45 | 43 | 41 | 39 | 36 | 35 | 32 | 30 |
| 20000 | 86 | 78 | 73 | 68 | 64 | 61 | 56 | 50 | 46 | 43 | 41 | 39 | 37 | 35 | 33 | 31. |
| 20500 | 87 | 79 | 73 | 68 | 64 | 62 | 56 | 50 | 46 | 44 | 42 | 39 | 37 | 36 | 33 | 31 |
| 21000 | 88 | 80 | 74 | 69 | 65 | 63 | 57 | 51 | 47 | 44 | 42 | 40 | 38 | 36 | 34 | 31 |
| 21500 | 89 | 81 | 74 | 70 | 66 | 63 | 58 | 52 | 47 | 45 | 43 | 40 | 38 | 37 | 34 | 32 |
| 22000 | 90 | 81 | 75 | 70 | 66 | 64 | 58 | 52 | 48 | 45 | 43 | 41 | 38 | 37 | 34 | 32 |
| 22500 | 91 | 82 | 77 | 72 | 68 | 65 | 59 | 53 | 48 | 46 | 44 | 41 | 39 | 38 | 35 | 33 |
| 23000 | 92 | 83 | 78 | 73 | 68 | 65 | 60 | 53 | 49 | 46 | 44 | 42 | 39 | 38 | 35 | 33 |
| 23500 | 93 | 85 | 79 | 73 | 69 | 66 | 60 | 54 | 49 | 47 | 45 | 42 | 40 | 38 | 35 | 33 |
| 24000 | 94 | 86 | 79 | 74 | 69 | 67 | 61 | 55 | 50 | 47 | 45 | 42 | 40 | 39 | 36 | 34 |
| 24500 | 95 | 87 | 80 | 74 | 71 | 68 | 62 | 55 | 50 | 48 | 45 | 43 | 40 | 39 | 36 | 34 |
| 25000 | 96 | 87 | 80 | 75 | 72 | 68 | 62 | 56 | 51 | 48 | 46 | 43 | 41 | 40 | 37 | 34 |
| 25500 | 97 | 88 | 81 | 77 | 72 | 69 | 63 | 56 | 51 | 49 | 46 | 44 | 41 | 40 | 37 | 34 |
| 26000 | 98 | 89 | 82 | 77 | 73 | 70 | 63 | 57 | 52 | 49 | 47 | 44 | 42 | 40 | 38 | 35 |
| 26500 | 99 | 90 | 83 | 78 | 73 | 70 | 64 | 57 | 52 | 50 | 47 | 45 | 42 | 41 | 38 | 35 |
| 27000 | 100 | 91 | 83 | 79 | 74 | 71 | 65 | 58 | 53 | 50 | 48 | 46 | 42 | 41 | 38 | 36 |
| 27500 | 101 | 92 | 85 | 79 | 74 | 72 | 65 | 58 | 53 | 51 | 48 | 45 | 43 | 41 | 38 | 36 |
| 28000 | 102 | 92 | 86 | 80 | 75 | 72 | 66 | 59 | 54 | 51 | 49 | 46 | 43 | 42 | 39 | 36 |
| 28500 | 103 | 93 | 87 | 80 | 76 | 73 | 66 | 60 | 54 | 52 | 49 | 46 | 44 | 42 | 39 | 37 |
| 29000 | 104 | 94 | 87 | 81 | 77 | 73 | 67 | 60 | 55 | 52 | 50 | 47 | 44 | 42 | 39 | 37 |
| 29500 | 105 | 95 | 88 | 82 | 77 | 74 | 68 | 60 | 55 | 52 | 50 | 47 | 44 | 43 | 40 | 37 |
| 30000 | 106 | 96 | 89 | 82 | 78 | 75 | 68 | 61 | 56 | 53 | 50 | 47 | 45 | 43 | 40 | 38 |
| 30500 | 107 | 97 | 89 | 83 | 79 | 75 | 69 | 62 | 56 | 53 | 51 | 48 | 45 | 44 | 40 | 38 |

# Diameter of Flues Required for the Passage of a Given Volume of Air at Various Standard Velocities

Sheet – 5

| Cu. Ft. of Air per Minute | 500 | 600 | 700 | 800 | 900 | 1000 | 1200 | 1500 | 1800 | 2000 | 2200 | 2500 | 2800 | 3000 | 3500 | 4000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31000 | 107 | 97 | 90 | 85 | 79 | 76 | 69 | 62 | 57 | 54 | 51 | 48 | 45 | 44 | 41 | 38 |
| 31500 | 108 | 98 | 91 | 85 | 80 | 76 | 70 | 63 | 57 | 54 | 52 | 49 | 46 | 44 | 41 | 39 |
| 32000 | 109 | 99 | 91 | 86 | 80 | 77 | 70 | 63 | 57 | 55 | 52 | 49 | 46 | 45 | 41 | 39 |
| 32500 | 110 | 100 | 92 | 86 | 81 | 78 | 71 | 63 | 58 | 55 | 52 | 49 | 47 | 45 | 42 | 39 |
| 33000 | 110 | 101 | 93 | 87 | 81 | 78 | 72 | 64 | 58 | 56 | 53 | 50 | 47 | 45 | 42 | 39 |
| 33500 | 111 | 102 | 94 | 88 | 82 | 79 | 72 | 64 | 58 | 56 | 53 | 50 | 47 | 46 | 42 | 40 |
| 34000 | 112 | 102 | 94 | 88 | 83 | 79 | 73 | 65 | 59 | 56 | 54 | 50 | 48 | 46 | 43 | 40 |
| 34500 | 113 | 103 | 95 | 89 | 85 | 80 | 73 | 65 | 60 | 57 | 54 | 51 | 48 | 46 | 43 | 40 |
| 35000 | 114 | 104 | 96 | 90 | 85 | 81 | 74 | 66 | 60 | 57 | 54 | 51 | 48 | 47 | 43 | 40 |
| 35500 | 115 | 105 | 96 | 90 | 86 | 81 | 74 | 66 | 61 | 57 | 55 | 52 | 49 | 47 | 44 | 41 |
| 36000 | 115 | 106 | 97 | 91 | 86 | 82 | 75 | 67 | 61 | 58 | 55 | 52 | 49 | 47 | 44 | 41 |
| 36500 | 116 | 106 | 98 | 91 | 87 | 82 | 75 | 67 | 61 | 58 | 56 | 52 | 49 | 48 | 44 | 41 |
| 37000 | 117 | 107 | 99 | 92 | 87 | 83 | 76 | 68 | 62 | 59 | 56 | 52 | 50 | 48 | 44 | 42 |
| 37500 | 118 | 107 | 100 | 93 | 88 | 83 | 76 | 68 | 62 | 59 | 56 | 53 | 50 | 48 | 45 | 42 |
| 38000 | 119 | 108 | 101 | 93 | 88 | 84 | 77 | 69 | 63 | 60 | 57 | 53 | 50 | 49 | 45 | 42 |
| 38500 | 119 | 109 | 102 | 94 | 89 | 85 | 77 | 69 | 63 | 60 | 57 | 54 | 51 | 49 | 45 | 42 |
| 39000 | 120 | 110 | 102 | 95 | 89 | 85 | 78 | 70 | 63 | 60 | 57 | 54 | 51 | 49 | 46 | 43 |
| 39500 | 121 | 110 | 103 | 95 | 90 | 86 | 78 | 70 | 64 | 61 | 58 | 54 | 51 | 50 | 46 | 43 |
| 40000 | 122 | 110 | 103 | 96 | 90 | 86 | 79 | 71 | 64 | 61 | 58 | 55 | 52 | 50 | 46 | 43 |
| 40500 | 122 | 111 | 104 | 96 | 91 | 87 | 79 | 71 | 65 | 61 | 59 | 55 | 62 | 50 | 46 | 44 |
| 41000 | 123 | 112 | 104 | 97 | 91 | 88 | 79 | 71 | 65 | 62 | 59 | 55 | 52 | 50 | 47 | 44 |
| 41500 | 124 | 113 | 105 | 98 | 92 | 88 | 80 | 72 | 65 | 62 | 59 | 56 | 52 | 50 | 47 | 44 |
| 42000 | 125 | 114 | 105 | 98 | 92 | 88 | 81 | 72 | 66 | 63 | 60 | 56 | 53 | 51 | 47 | 44 |
| 42500 | 125 | 115 | 106 | 99 | 93 | 89 | 81 | 73 | 68 | 63 | 60 | 56 | 53 | 51 | 48 | 44 |
| 43000 | 126 | 115 | 106 | 99 | 93 | 89 | 82 | 73 | 66 | 63 | 60 | 57 | 53 | 51 | 48 | 44 |
| 43500 | 127 | 116 | 107 | 100 | 94 | 90 | 82 | 73 | 67 | 63 | 61 | 57 | 53 | 51 | 48 | 45 |
| 44000 | 127 | 116 | 108 | 101 | 95 | 90 | 82 | 74 | 67 | 64 | 61 | 57 | 54 | 52 | 48 | 45 |
| 44500 | 128 | 117 | 108 | 101 | 95 | 91 | 83 | 74 | 68 | 64 | 61 | 58 | 54 | 52 | 49 | 46 |
| 45000 | 129 | 118 | 109 | 102 | 96 | 91 | 83 | 75 | 68 | 65 | 62 | 58 | 55 | 53 | 49 | 46 |
| 45500 | 130 | 119 | 110 | 102 | 96 | 92 | 84 | 75 | 68 | 65 | 62 | 58 | 55 | 53 | 49 | 46 |
| 46000 | 130 | 119 | 110 | 103 | 97 | 93 | 84 | 75 | 69 | 65 | 62 | 59 | 55 | 53 | 50 | 46 |
| 46500 | 131 | 120 | 110 | 103 | 97 | 93 | 85 | 76 | 69 | 66 | 63 | 59 | 56 | 54 | 50 | 47 |
| 47000 | 132 | 120 | 111 | 104 | 98 | 93 | 85 | 76 | 70 | 66 | 63 | 59 | 56 | 54 | 50 | 47 |
| 47500 | 132 | 121 | 112 | 104 | 99 | 94 | 86 | 77 | 70 | 66 | 63 | 60 | 56 | 54 | 50 | 47 |
| 48000 | 133 | 122 | 113 | 105 | 100 | 95 | 86 | 77 | 70 | 67 | 64 | 60 | 56 | 55 | 50 | 47 |

# Diameter of Flues Required for the Passage of a Given Volume of Air at Various Standard Velocities

SHEET – 6

| CU. FT. OF AIR PER MINUTE | 500 | 600 | 700 | 800 | 900 | 1000 | 1200 | 1500 | 1800 | 2000 | 2200 | 2500 | 2800 | 3000 | 3500 | 4000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 48500 | — | — | 113 | 105 | 100 | 95 | 87 | 77 | 71 | 67 | 64 | 60 | 57 | 55 | 51 | 47 |
| 49000 | — | — | 114 | 106 | 100 | 95 | 87 | 78 | 71 | 68 | 64 | 60 | 57 | 55 | 51 | 48 |
| 49500 | — | — | 114 | 107 | 101 | 96 | 87 | 78 | 72 | 68 | 65 | 61 | 57 | 56 | 51 | 48 |
| 50000 | — | — | 115 | 107 | 101 | 96 | 88 | 79 | 72 | 68 | 65 | 61 | 58 | 56 | 51 | 48 |
| 50500 | — | — | 115 | 108 | 102 | 97 | 88 | 79 | 72 | 68 | 65 | 61 | 58 | 56 | 52 | 49 |
| 51000 | — | — | 115 | 108 | 102 | 97 | 89 | 79 | 73 | 69 | 66 | 62 | 58 | 56 | 52 | 49 |
| 51500 | — | — | 116 | 109 | 103 | 98 | 89 | 80 | 73 | 69 | 66 | 62 | 58 | 56 | 52 | 49 |
| 52000 | — | — | 117 | 110 | 103 | 98 | 90 | 80 | 73 | 70 | 66 | 62 | 59 | 57 | 53 | 49 |
| 52500 | — | — | 118 | 110 | 104 | 99 | 90 | 81 | 74 | 70 | 67 | 63 | 59 | 57 | 53 | 50 |
| 53000 | — | — | 118 | 110 | 104 | 99 | 90 | 81 | 74 | 70 | 67 | 63 | 59 | 57 | 53 | 50 |
| 53500 | — | — | 119 | 111 | 104 | 99 | 91 | 81 | 74 | 70 | 67 | 63 | 60 | 58 | 53 | 50 |
| 54000 | — | — | 119 | 111 | 105 | 100 | 91 | 82 | 75 | 71 | 68 | 63 | 60 | 58 | 54 | 50 |
| 54500 | — | — | 120 | 112 | 105 | 100 | 92 | 82 | 75 | 71 | 68 | 64 | 60 | 58 | 54 | 50 |
| 55000 | — | — | — | 113 | 106 | 101 | 92 | 82 | 75 | 72 | 68 | 64 | 60 | 58 | 54 | 51 |
| 55500 | — | — | — | 113 | 106 | 101 | 93 | 83 | 76 | 72 | 68 | 64 | 61 | 59 | 54 | 51 |
| 56000 | — | — | — | 114 | 107 | 102 | 93 | 83 | 76 | 72 | 69 | 65 | 61 | 59 | 55 | 51 |
| 56500 | — | — | — | 114 | 107 | 102 | 93 | 84 | 76 | 72 | 69 | 65 | 61 | 59 | 55 | 51 |
| 57000 | — | — | — | 115 | 108 | 103 | 94 | 84 | 77 | 73 | 69 | 65 | 62 | 60 | 55 | 52 |
| 57500 | — | — | — | 115 | 109 | 103 | 94 | 84 | 77 | 73 | 70 | 65 | 62 | 60 | 55 | 52 |
| 58000 | — | — | — | 116 | 109 | 104 | 95 | 85 | 77 | 73 | 70 | 66 | 62 | 60 | 56 | 52 |
| 58500 | — | — | — | 116 | 110 | 104 | 95 | 85 | 78 | 74 | 70 | 66 | 62 | 60 | 56 | 52 |
| 59000 | — | — | — | 117 | 110 | 104 | 95 | 85 | 78 | 74 | 71 | 66 | 63 | 60 | 56 | 52 |
| 59500 | — | — | — | 117 | 110 | 105 | 96 | 86 | 78 | 74 | 71 | 67 | 63 | 61 | 56 | 53 |
| 60000 | — | — | — | 118 | 110 | 105 | 96 | 86 | 79 | 75 | 71 | 67 | 63 | 61 | 57 | 53 |
| 60500 | — | — | — | 118 | 111 | 106 | 97 | 86 | 79 | 75 | 72 | 67 | 63 | 61 | 57 | 53 |
| 61000 | — | — | — | 119 | 111 | 106 | 97 | 87 | 79 | 75 | 72 | 67 | 64 | 62 | 57 | 53 |
| 61500 | — | — | — | 119 | 112 | 107 | 97 | 87 | 80 | 76 | 72 | 68 | 64 | 62 | 57 | 53 |
| 62000 | — | — | — | 120 | 113 | 107 | 98 | 88 | 80 | 76 | 72 | 68 | 64 | 62 | 57 | 54 |
| 62500 | — | — | — | — | 113 | 108 | 98 | 88 | 80 | 76 | 73 | 68 | 64 | 62 | 58 | 54 |
| 63000 | — | — | — | — | 114 | 108 | 98 | 88 | 80 | 76 | 73 | 68 | 65 | 63 | 58 | 54 |
| 63500 | — | — | — | — | 114 | 109 | 99 | 89 | 80 | 77 | 73 | 69 | 65 | 63 | 58 | 54 |
| 64000 | — | — | — | — | 115 | 109 | 99 | 89 | 81 | 77 | 73 | 69 | 65 | 63 | 58 | 55 |
| 64500 | — | — | — | — | 115 | 110 | 100 | 89 | 81 | 77 | 74 | 69 | 65 | 63 | 58 | 55 |
| 65000 | — | — | — | — | 115 | 110 | 100 | 90 | 81 | 78 | 74 | 70 | 66 | 64 | 59 | 55 |
| 65500 | — | — | — | — | 116 | 110 | 101 | 90 | 82 | 78 | 74 | 70 | 66 | 64 | 59 | 55 |

# Diameter of Flues Required for the Passage of a Given Volume of Air at Various Standard Velocities

SHEET – 7

| Cu. Ft Air Per-Min | 2000 | 2200 | 2500 | 2880 | 3000 | 3500 | 4000 | Cu Ft Air Per-Min | 2000 | 2200 | 2500 | 2800 | 3000 | 3500 | 4000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 66000 | 78 | 75 | 70 | 66 | 64 | 59 | 56 | 83500 | 88 | 84 | 79 | 74 | 72 | 67 | 62 |
| 66500 | 79 | 75 | 70 | 66 | 64 | 60 | 56 | 84000 | 88 | 84 | 79 | 75 | 72 | 67 | 63 |
| 67000 | 79 | 75 | 71 | 67 | 64 | 60 | 56 | 84500 | 88 | 84 | 79 | 75 | 72 | 67 | 63 |
| 67500 | 79 | 75 | 71 | 67 | 65 | 60 | 56 | 85000 | 89 | 85 | 79 | 75 | 73 | 67 | 63 |
| 68000 | 79 | 76 | 71 | 67 | 65 | 60 | 56 | 85500 | 89 | 85 | 80 | 75 | 73 | 67 | 63 |
| 68500 | 80 | 76 | 71 | 67 | 65 | 60 | 57 | 86000 | 89 | 85 | 80 | 76 | 73 | 68 | 63 |
| 69000 | 80 | 76 | 71 | 68 | 65 | 61 | 57 | 86500 | 89 | 85 | 80 | 76 | 73 | 68 | 63 |
| 69500 | 80 | 76 | 72 | 68 | 66 | 61 | 57 | 87000 | 90 | 86 | 80 | 76 | 74 | 68 | 64 |
| 70000 | 81 | 77 | 72 | 68 | 66 | 61 | 57 | 87500 | 90 | 86 | 81 | 76 | 74 | 68 | 64 |
| 70500 | 81 | 77 | 72 | 68 | 66 | 61 | 57 | 88000 | 90 | 86 | 81 | 76 | 74 | 68 | 64 |
| 71000 | 81 | 77 | 73 | 69 | 66 | 61 | 57 | 88500 | 91 | 86 | 81 | 77 | 74 | 68 | 64 |
| 71500 | 81 | 78 | 73 | 69 | 67 | 62 | 58 | 89000 | 91 | 87 | 81 | 77 | 74 | 69 | 64 |
| 72000 | 82 | 78 | 73 | 69 | 67 | 62 | 58 | 89500 | 91 | 87 | 82 | 77 | 74 | 69 | 64 |
| 72500 | 82 | 78 | 73 | 69 | 67 | 62 | 58 | 90000 | 81 | 87 | 82 | 77 | 75 | 69 | 65 |
| 73000 | 82 | 78 | 74 | 70 | 67 | 62 | 58 | 90500 | 92 | 87 | 82 | 77 | 75 | 69 | 65 |
| 73500 | 82 | 79 | 74 | 70 | 68 | 63 | 58 | 91000 | 92 | 88 | 82 | 78 | 75 | 70 | 65 |
| 74000 | 83 | 79 | 74 | 70 | 68 | 63 | 59 | 91500 | 92 | 88 | 82 | 78 | 75 | 70 | 65 |
| 74500 | 83 | 79 | 74 | 70 | 68 | 63 | 59 | 92000 | 92 | 88 | 83 | 78 | 75 | 70 | 65 |
| 75000 | 83 | 79 | 75 | 71 | 68 | 63 | 59 | 92500 | 93 | 88 | 83 | 79 | 76 | 70 | 66 |
| 75500 | 84 | 80 | 75 | 71 | 68 | 63 | 59 | 93000 | 93 | 89 | 83 | 79 | 76 | 70 | 66 |
| 76000 | 84 | 80 | 75 | 71 | 69 | 64 | 60 | 93500 | 93 | 89 | 83 | 79 | 76 | 70 | 66 |
| 76500 | 84 | 80 | 75 | 71 | 69 | 64 | 60 | 94000 | 93 | 89 | 84 | 79 | 76 | 71 | 66 |
| 77000 | 85 | 81 | 76 | 72 | 69 | 64 | 60 | 94500 | 94 | 89 | 84 | 79 | 76 | 71 | 66 |
| 77500 | 85 | 81 | 76 | 72 | 69 | 64 | 60 | 95000 | 94 | 89 | 84 | 79 | 77 | 71 | 66 |
| 78000 | 85 | 81 | 76 | 72 | 70 | 64 | 60 | 95500 | 94 | 90 | 84 | 80 | 77 | 71 | 67 |
| 78500 | 85 | 81 | 76 | 72 | 70 | 65 | 60 | 96000 | 94 | 90 | 84 | 80 | 77 | 71 | 67 |
| 79000 | 86 | 82 | 77 | 72 | 70 | 65 | 61 | 96500 | 95 | 90 | 84 | 80 | 77 | 72 | 67 |
| 79500 | 86 | 82 | 77 | 73 | 70 | 65 | 61 | 97000 | 95 | 90 | 85 | 80 | 77 | 72 | 67 |
| 80000 | 86 | 82 | 77 | 73 | 70 | 65 | 61 | 97500 | 95 | 90 | 85 | 80 | 78 | 72 | 67 |
| 80500 | 86 | 82 | 77 | 73 | 71 | 65 | 61 | 98000 | 95 | 91 | 85 | 81 | 78 | 72 | 68 |
| 81000 | 87 | 83 | 78 | 73 | 71 | 66 | 61 | 98500 | 95 | 91 | 85 | 81 | 78 | 72 | 68 |
| 81500 | 87 | 83 | 78 | 74 | 71 | 66 | 62 | 99000 | 96 | 91 | 86 | 81 | 78 | 72 | 68 |
| 82000 | 87 | 83 | 78 | 74 | 71 | 66 | 62 | 99500 | 96 | 92 | 86 | 81 | 78 | 73 | 68 |
| 82500 | 87 | 83 | 78 | 74 | 72 | 66 | 62 | 100000 | 96 | 92 | 86 | 81 | 79 | 73 | 68 |
| 83000 | 88 | 84 | 79 | 74 | 72 | 66 | 62 |  |  |  |  |  |  |  |  |

## Size of Round and Rectangular Flues Required for the Passage of a Given Volume of Air at a Given Velocity

SHEET-1

| FT. VEL. PER MIN. | | CUBIC FEET OF AIR PER MINUTE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 100 | 200 | 300 | 400 | 500 | 1000 | 1500 | 2000 | 2500 | 3000 |
| 350 | AREA | 46.1 | 82.3 | 124 | 165 | 206 | 411 | 617 | 823 | 1028 | 1234 |
| | DIAM | 8 | 10 | 13 | 15 | 18 | 23 | 28 | 33 | 37 | 40 |
| | RECT | 6X8 | 8X12 | 12X12 | 12X14 | 12X18 | 18X24 | 22X28 | 24X36 | 28X38 | 28X44 |
| 400 | AREA | 36 | 72 | 108 | 144 | 180 | 360 | 540 | 720 | 900 | 1080 |
| | DIAM | 7 | 10 | 12 | 14 | 16 | 22 | 27 | 31 | 34 | 37 |
| | RECT | 6X6 | 8X10 | 10X12 | 12X12 | 12X16 | 18X20 | 20X28 | 24X30 | 28X32 | 28X40 |
| 450 | AREA | 32 | 64 | 96 | 128 | 160 | 320 | 480 | 640 | 800 | 960 |
| | DIAM | 7 | 10 | 12 | 13 | 15 | 20 | 25 | 29 | 32 | 35 |
| | RECT | 6X6 | 8X8 | 8X12 | 12X12 | 12X14 | 16X20 | 20X24 | 24X28 | 28X30 | 28X34 |
| 500 | AREA | 29 | 58 | 87 | 116 | 144 | 290 | 434 | 580 | 724 | 870 |
| | DIAM | 7. | 9 | 11 | 13 | 14 | 20 | 24 | 28 | 31 | 34 |
| | RECT | 6X6 | 8X8 | 8X12 | 10X12 | 12X12 | 16X18 | 20X22 | 24X24 | 26X28 | 28X32 |
| 550 | AREA | 26 | 52 | 79 | 105 | 131 | 262 | 393 | 524 | 655 | 786 |
| | DIAM | 6 | 9 | 10 | 12 | 13 | 19 | 22 | 26 | 29 | 32 |
| | RECT | 6X6 | 8X8 | 8X10 | 10X12 | 10X14 | 16X18 | 20X20 | 22X24 | 24X28 | 28X28 |
| 600 | AREA | 24 | 48 | 72 | 96 | 120 | 240 | 360 | 480 | 600 | 720 |
| | DIAM | 6 | 8 | 10 | 11 | 13 | 18 | 22 | 25 | 28 | 31 |
| | RECT | 4X6 | 6X8 | 6X12 | 8X12 | 10X12 | 16X16 | 18X20 | 20X24 | 24X26 | 26X28 |
| 650 | AREA | 22 | 44 | 67 | 89 | 112 | 222 | 333 | 442 | 564 | 664 |
| | DIAM | 8 | 8 | 10 | 11 | 12 | 17 | 21 | 24 | 27 | 29 |
| | RECT | 4X6 | 6X8 | 6X12 | 8X12 | 10X12 | 14X16 | 18X18 | 20X22 | 24X24 | 26X26 |
| 700 | AREA | 21 | 42 | 63 | 83. | 103 | 206 | 309 | 410 | 513 | 618 |
| | DIAM | 6 | 8 | 9 | 11 | 12 | 16 | 20 | 23 | 26 | 28 |
| | RECT | 4X6 | 6X8 | 6X10 | 8X12 | 10X10 | 14X16 | 16X20 | 20X22 | 22X24 | 24X26 |
| 750 | AREA | 19 | 39 | 57 | 77 | 96 | 192 | 228 | 384 | 480 | 576 |
| | DIAM | 5 | 8 | 9 | 10 | 11 | 16 | 19 | 22 | 25 | 27 |
| | RECT | 4X6 | 6X8 | 6X10 | 8X10 | 10X10 | 14X14 | 16X18 | 20X20 | 22X22 | 24X24 |
| 800 | AREA | 18 | 36 | 54 | 72 | 90 | 180 | 270 | 360 | 450 | 540 |
| | DIAM | 5 | 7 | 9 | 10 | 11 | 16 | 19 | 22 | 24 | 27 |
| | RECT | 4X6 | 6X6 | 6X10 | 8X10 | 8X12 | 14X14 | 16X18 | 18X20 | 22X22 | 24X24 |

# Size of Round and Rectangular Flues Required for the Passage of a Given Volume of Air at a Given Velocity

SHEET-2

| FT. VEL. PER MIN. | | CUBIC FEET OF AIR PER MINUTE. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 100 | 200 | 300 | 400 | 500 | 1000 | 1500 | 2000 | 2500 | 3000 |
| 850 | AREA | 17 | 34 | 51 | 68 | 85 | 170 | 225 | 340 | 425 | 510 |
| | DIAM | 5 | 7 | 9 | 10 | 11 | 15 | 18 | 21 | 24 | 26 |
| | RECT | 4×6 | 6×6 | 6×10 | 8×10 | 8×12 | 14×14 | 16×16 | 18×18 | 20×22 | 22×24 |
| 900 | AREA | 16 | 32 | 48 | 64 | 80 | 160 | 240 | 320 | 400 | 480 |
| | DIAM | 5 | 7 | 8 | 9 | 11 | 15 | 18 | 21 | 23 | 25 |
| | RECT | 4×4 | 6×6 | 6×8 | 6×8 | 8×10 | 12×14 | 16×16 | 18×18 | 20×20 | 22×22 |
| 950 | AREA | 16 | 31 | 46 | 61 | 76 | 152 | 228 | 304 | 380 | 456 |
| | DIAM | 5 | 7 | 8 | 9 | 10 | 14 | 17 | 20 | 22 | 24 |
| | RECT | 4×4 | 6×6 | 6×8 | 8×8 | 8×10 | 12×14 | 14×16 | 18×18 | 20×20 | 22×22 |
| 1000 | AREA | 15 | 29 | 44 | 58 | 72 | 144 | 216 | 288 | 360 | 432 |
| | DIAM | 5 | 7 | 8 | 9 | 10 | 14 | 17 | 20 | 22 | 24 |
| | RECT | 4×4 | 6×6 | 6×8 | 8×8 | 8×10 | 12×12 | 14×16 | 16×18 | 18×20 | 20×22 |
| 1050 | AREA | 14 | 28 | 42 | 56 | 69 | 138 | 207 | 276 | 345 | 414 |
| | DIAM | 5 | 6 | 8 | 9 | 10 | 14 | 17 | 19 | 21 | 23 |
| | RECT | 4×4 | 6×6 | 6×8 | 8×8 | 8×10 | 12×12 | 14×16 | 16×18 | 18×20 | 20×22 |
| 1100 | AREA | 13 | 26 | 40 | 53 | 66 | 130 | 195 | 260 | 325 | 390 |
| | DIAM | 5 | 6 | 8 | 9 | 10 | 13 | 16 | 19 | 21 | 23 |
| | RECT | 4×4 | 6×6 | 6×8 | 8×8 | 8×10 | 12×12 | 14×14 | 16×18 | 18×18 | 20×20 |
| 1150 | AREA | 13 | 25 | 38 | 50 | 62 | 126 | 189 | 251 | 314 | 377 |
| | DIAM | 5 | 6 | 7 | 8 | 9 | 13 | 16 | 18 | 20 | 22 |
| | RECT | 4×4 | 6×6 | 6×8 | 8×8 | 8×8 | 12×12 | 14×14 | 16×16 | 18×18 | 20×20 |
| 1200 | AREA | 12 | 24 | 36 | 48 | 60 | 120 | 180 | 240 | 300 | 360 |
| | DIAM | 4 | 6 | 7 | 8 | 9 | 13 | 16 | 18 | 20 | 22 |
| | RECT | 4×4 | 4×6 | 6×6 | 6×8 | 8×8 | 10×12 | 12×16 | 16×16 | 18×18 | 18×20 |
| 1250 | AREA | 12 | 23 | 36 | 46 | 58 | 115 | 173 | 231 | 289 | 347 |
| | DIAM | 4 | 6 | 7 | 8 | 9 | 13 | 15 | 18 | 20 | 21 |
| | RECT | 4×4 | 4×6 | 6×6 | 6×8 | 8×8 | 10×12 | 12×14 | 14×16 | 16×20 | 16×22 |

## Size of Round and Rectangular Flues Required for the Passage of a Given Volume of Air at a Given Velocity

SHEET-3

| FT. VEL. PER MIN | | CUBIC FEET OF AIR PER MINUTE. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 3500 | 4000 | 4500 | 5000 | 5500 | 6000 | 6500 | 7000 | 7500 | 8000 |
| 350 | AREA | 1439 | 1646 | 1850 | 2056 | 2261 | 2467 | 2672 | 2880 | 3083 | 3291 |
| | DIAM | 43 | 46 | 49 | 52 | 54 | 56 | 59 | 61 | 63 | 65 |
| | RECT | 28X52 | 36X46 | 36X52 | 36X58 | 46X50 | 48X52 | 48X56 | 48X60 | 48X66 | 48X70 |
| 400 | AREA | 1260 | 1440 | 1620 | 1800 | 1980 | 2160 | 2340 | 2520 | 2700 | 2880 |
| | DIAM | 40 | 43 | 46 | 48 | 51 | 53 | 55 | 57 | 59 | 61 |
| | RECT | 28X46 | 30X48 | 36X46 | 36X50 | 42X48 | 42X52 | 42X56 | 48X54 | 48X58 | 48X60 |
| 450 | AREA | 1120 | 1280 | 1440 | 1600 | 1760 | 1920 | 2080 | 2240 | 2400 | 2560 |
| | DIAM | 38 | 41 | 43 | 46 | 48 | 50 | 52 | 54 | 56 | 57 |
| | RECT | 28X40 | 30X44 | 36X43 | 36X46 | 42X42 | 42X46 | 42X50 | 42X54 | 42X58 | 42X62 |
| 500 | AREA | 1014 | 1160 | 1324 | 1450 | 1594 | 1740 | 1884 | 2030 | 2160 | 2304 |
| | DIAM | 36 | 39 | 41 | 43 | 45 | 47 | 49 | 51 | 53 | 55 |
| | RECT | 30X34 | 30X40 | 34X40 | 36X42 | 38X42 | 42X42 | 42X46 | 42X50 | 42X52 | 42X56 |
| 550 | AREA | 917 | 1048 | 1179 | 1310 | 1441 | 1572 | 1703 | 1834 | 1965 | 2096 |
| | DIAM | 35 | 37 | 39 | 41 | 43 | 45 | 47 | 49 | 50 | 52 |
| | RECT | 28X34 | 28X38 | 34X36 | 36X38 | 36X40 | 36X44 | 42X42 | 42X44 | 42X48 | 42X50 |
| 600 | AREA | 840 | 960 | 1080 | 1200 | 1320 | 1440 | 1560 | 1680 | 1800 | 1920 |
| | DIAM | 33 | 35 | 38 | 400 | 41 | 43 | 45 | 47 | 48 | 50 |
| | RECT | 28X30 | 28X34 | 32X34 | 34X36 | 36X38 | 36X40 | 36X44 | 36X48 | 36X50 | 42X46 |
| 650 | AREA | 774 | 885 | 996 | 1106 | 1217 | 1330 | 1441 | 1554 | 1665 | 1776 |
| | DIAM | 33 | 34 | 36 | 38 | 40 | 42 | 43 | 45 | 46 | 48 |
| | RECT | 28X28 | 28X32 | 28X36 | 30X36 | 34X36 | 36X38 | 36X40 | 36X44 | 36X46 | 42X44 |
| 700 | AREA | 721 | 824 | 927 | 1030 | 1133 | 1236 | 1339 | 1440 | 1547 | 1650 |
| | DIAM | 31 | 33 | 35 | 37 | 38 | 40 | 41 | 43 | 45 | 46 |
| | RECT | 26X28 | 28X30 | 28X34 | 30X36 | 30X38 | 30X42 | 36X38 | 36X40 | 36X44 | 36X46 |
| 750 | AREA | 672 | 768 | 864 | 960 | 1056 | 1152 | 1248 | 1344 | 1440 | 1536 |
| | DIAM | 30 | 32 | 34 | 35 | 37 | 39 | 40 | 42 | 43 | 45 |
| | RECT | 24X28 | 28X28 | 28X32 | 30X32 | 32X34 | 34X34 | 36X36 | 36X38 | 36X40 | 36X44 |
| 800 | AREA | 630 | 720 | 810 | 900 | 990 | 1080 | 1170 | 1260 | 1350 | 1440 |
| | DIAM | 29 | 31 | 33 | 34 | 36 | 38 | 39 | 40 | 42 | 43 |
| | RECT | 24X26 | 26X28 | 28X30 | 30X30 | 30X34 | 32X34 | 34X36 | 36X36 | 36X38 | 36X40 |

## Size of Round and Rectangular Flues Required for the Passage of a Given Volume of Air at a Given Velocity

SHEET-4

| FT. VEL. PER MIN. | | CUBIC FEET OF AIR PER MINUTE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 3500 | 4000 | 4500 | 5000 | 5500 | 6000 | 6500 | 7000 | 7500 | 8000 |
| 850 | AREA | 595 | 680 | 765 | 850 | 935 | 1020 | 1105 | 1190 | 1275 | 1360 |
| | DIAM | 28 | 30 | 32 | 33 | 35 | 36 | 38 | 39 | 41 | 42 |
| | RECT | 24X26 | 26X26 | 28X28 | 30X30 | 30X32 | 30X34 | 34X34 | 34X36 | 36X36 | 36X38 |
| 900 | AREA | 560 | 640 | 720 | 800 | 880 | 960 | 1040 | 1120 | 1200 | 1280 |
| | DIAM | 27 | 29 | 31 | 32 | 34 | 35 | 37 | 38 | 40 | 41 |
| | RECT | 24X24 | 24X26 | 26X28 | 28X30 | 30X30 | 30X32 | 30X36 | 30X38 | 30X40 | 36X36 |
| 950 | AREA | 532 | 608 | 684 | 760 | 836 | 912 | 988 | 1064 | 1140 | 1216 |
| | DIAM | 26 | 28 | 30 | 31 | 33 | 34 | 36 | 37 | 38 | 40 |
| | RECT | 22X24 | 24X26 | 24X30 | 24X32 | 24X36 | 24X38 | 24X42 | 30X36 | 30X38 | 30X42 |
| 1000 | AREA | 504 | 576 | 648 | 720 | 792 | 864 | 936 | 1008 | 1080 | 1150 |
| | DIAM | 26 | 28 | 29 | 31 | 32 | 34 | 36 | 36 | 38 | 39 |
| | RECT | 22X24 | 22X26 | 24X28 | 24X30 | 24X34 | 24X36 | 24X40 | 30X34 | 30X38 | 30X40 |
| 1050 | AREA | 483 | 552 | 621 | 690 | 759 | 828 | 897 | 966 | 1035 | 1104 |
| | DIAM | 25 | 27 | 29 | 30 | 31 | 33 | 34 | 35 | 37 | 38 |
| | RECT | 20X24 | 22X26 | 24X26 | 24X30 | 24X32 | 24X36 | 24X38 | 24X40 | 24X44 | 30X38 |
| 1100 | AREA | 455 | 520 | 585 | 650 | 715 | 780 | 845 | 910 | 975 | 1040 |
| | DIAM | 24 | 26 | 28 | 29 | 31 | 32 | 33 | 34 | 36 | 37 |
| | RECT | 20X24 | 22X24 | 24X26 | 24X28 | 24X30 | 24X34 | 24X36 | 24X38 | 24X42 | 24X44 |
| 1150 | AREA | 440 | 503 | 566 | 629 | 692 | 755 | 814 | 877 | 940 | 1003 |
| | DIAM | 24 | 26 | 27 | 29 | 30 | 31 | 32 | 34 | 35 | 36 |
| | RECT | 20X22 | 22X22 | 24X24 | 24X26 | 24X30 | 24X32 | 24X34 | 24X38 | 24X40 | 24X42 |
| 1200 | AREA | 420 | 480 | 540 | 600 | 660 | 720 | 780 | 840 | 900 | 960 |
| | DIAM | 24 | 25 | 27 | 28 | 29 | 31 | 32 | 33 | 34 | 36 |
| | RECT | 20X22 | 22X22 | 24X24 | 24X26 | 24X28 | 24X30 | 24X34 | 24X36 | 24X38 | 24X40 |
| 1250 | AREA | 405 | 463 | 521 | 579 | 634 | 692 | 750 | 808 | 866 | 924 |
| | DIAM | 23 | 25 | 26 | 28 | 29 | 30 | 31 | 32 | 34 | 35 |
| | RECT | 18X22 | 18X26 | 20X26 | 20X30 | 22X30 | 22X32 | 22X34 | 24X34 | 24X36 | 24X38 |

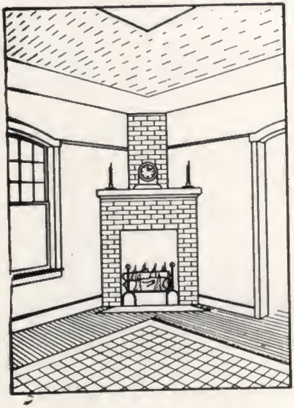
## Belting

### Horse-Power of a Leather Belt One Inch Wide

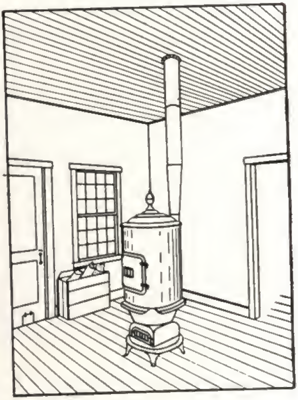
| Velocity in feet per Second | Laced Belts—Thickness in Inches | | | | | | |
|---|---|---|---|---|---|---|---|
| | $\frac{1}{7}$ .143 | $\frac{1}{6}$ .167 | $\frac{3}{16}$ .187 | $\frac{7}{32}$ .219 | $\frac{1}{4}$ .250 | $\frac{5}{16}$ .312 | $\frac{1}{3}$ .333 |
| 10 | .51 | .59 | .63 | .73 | .84 | 1.05 | 1.18 |
| 15 | .75 | .88 | 1.00 | 1.16 | 1.32 | 1.66 | 1.77 |
| 20 | 1.00 | 1.17 | 1.32 | 1.54 | 1.75 | 2.19 | 2.34 |
| 25 | 1.23 | 1.43 | 1.61 | 1.88 | 2.16 | 2.69 | 2.86 |
| 30 | 1.47 | 1.72 | 1.93 | 2.25 | 2.58 | 3.22 | 3.44 |
| 35 | 1.69 | 1.97 | 2.22 | 2.59 | 2.96 | 3.70 | 3.94 |
| 40 | 1.90 | 2.22 | 2.49 | 2.90 | 3.32 | 4.15 | 4.44 |
| 45 | 2.09 | 2.45 | 2.75 | 3.21 | 3.67 | 4.58 | 4.89 |
| 50 | 2.27 | 2.65 | 2.98 | 3.48 | 3.98 | 4.97 | 5.30 |
| 55 | 2.44 | 2.84 | 3.19 | 3.72 | 4.26 | 5.32 | 5.69 |
| 60 | 2.58 | 3.01 | 3.38 | 3.95 | 4.51 | 5.64 | 6.02 |
| 65 | 2.71 | 3.16 | 3.55 | 4.14 | 4.74 | 5.92 | 6.32 |
| 70 | 2.81 | 3.27 | 3.68 | 4.29 | 4.91 | 6.14 | 6.54 |
| 75 | 2.89 | 3.37 | 3.79 | 4.42 | 5.05 | 6.31 | 6.73 |
| 80 | 2.94 | 3.43 | 3.86 | 4.50 | 5.15 | 6.44 | 6.86 |
| 85 | 2.97 | 3.47 | 3.90 | 4.55 | 5.20 | 6.50 | 6.93 |
| 90 | 2.97 | 3.47 | 3.90 | 4.55 | 5.20 | 6.50 | 6.93 |

The horse-power becomes a maximum at 87.41 feet per second, 5,245 per minute.

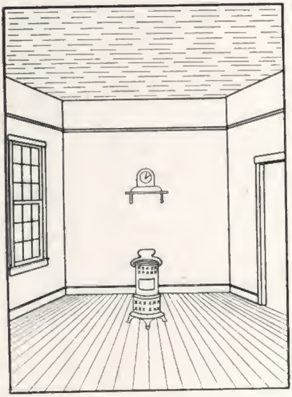
# The Evolution of Heating Systems



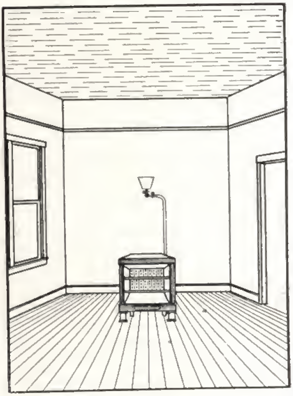
Open Fire Place



Wood Burning Stove

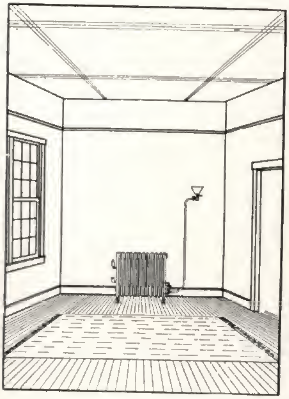


Oil Heater

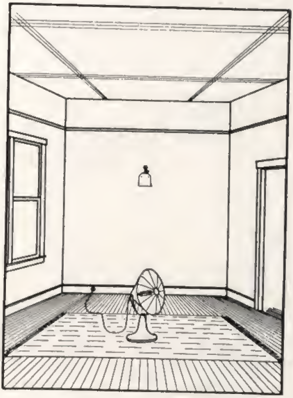


Gas Heater

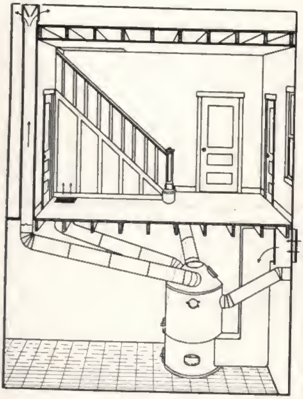
# The Evolution of Heating Systems



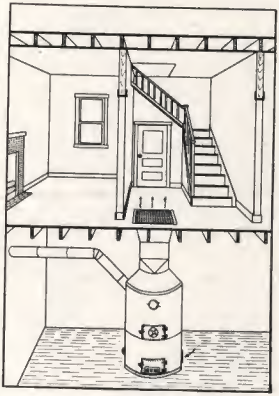
Gas Steam Radiator



Electric Heater

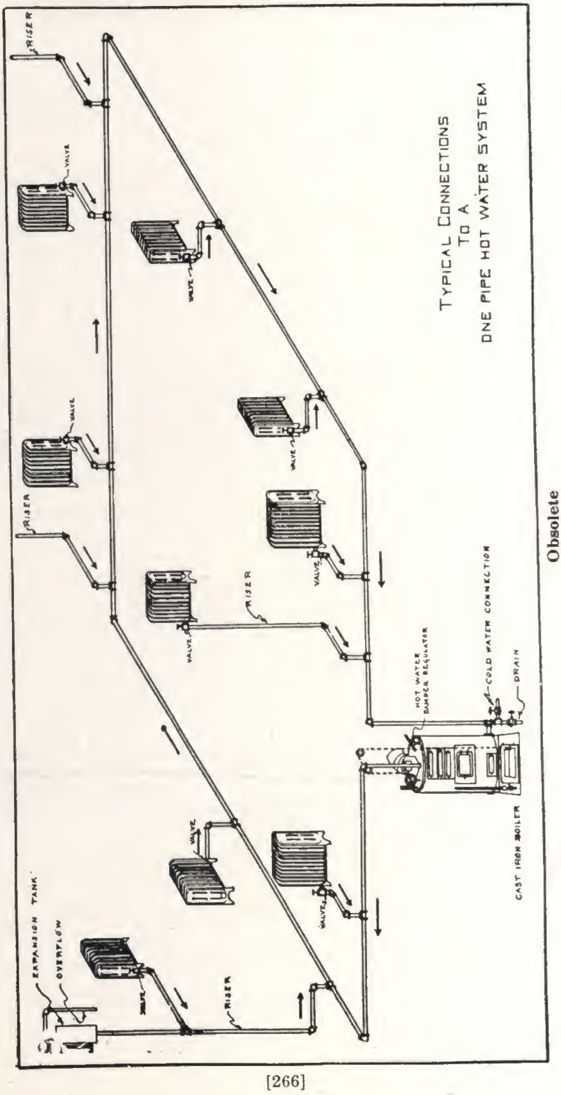


Hot Air Furnace



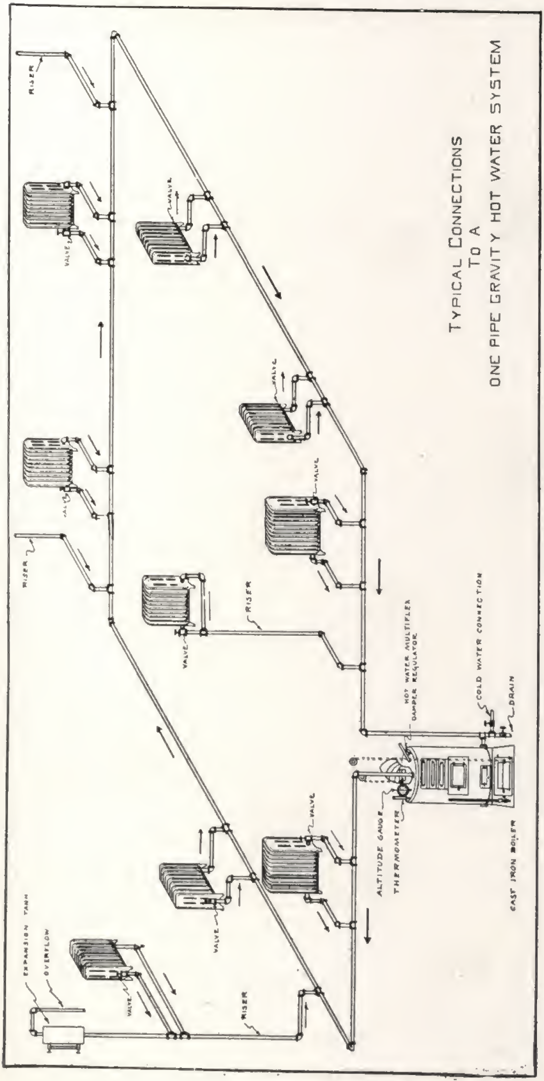
Pipeless Furnace

# The Evolution of Heating Systems



Obsolete

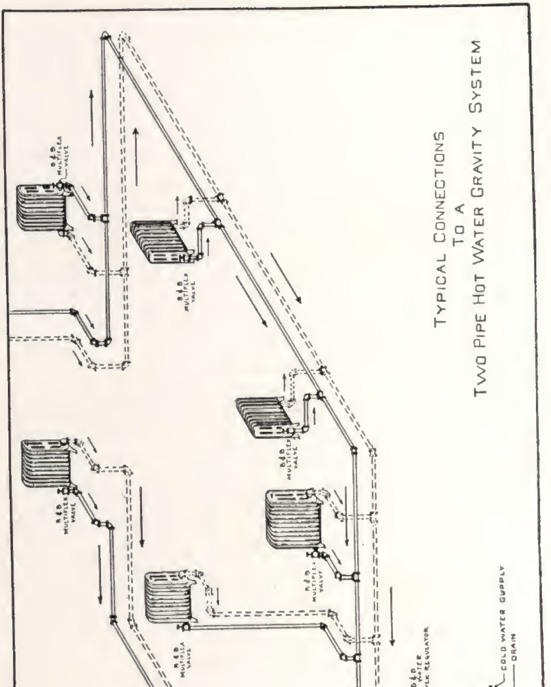
## The Evolution of Heating Systems



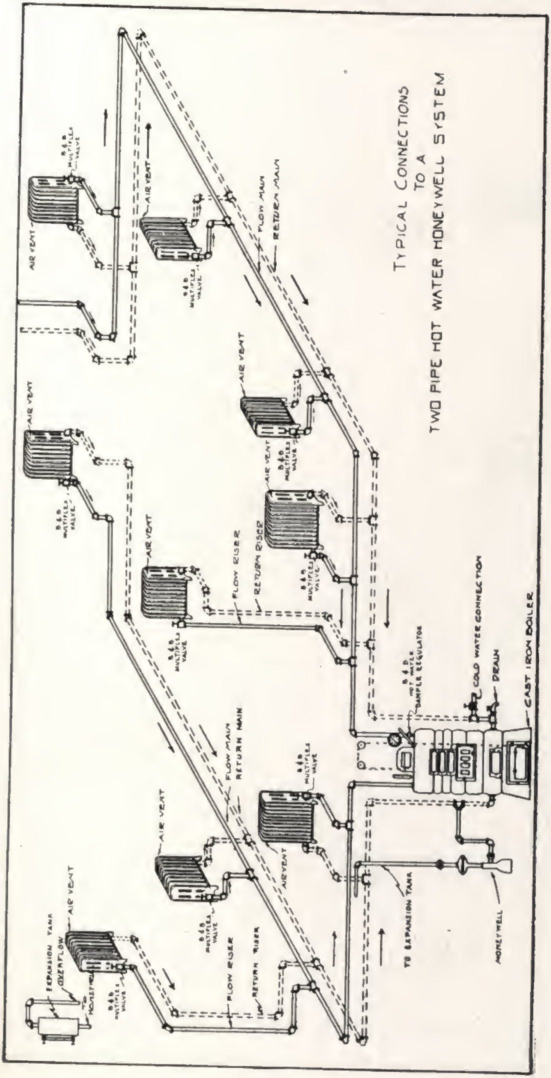
TYPICAL CONNECTIONS
TO A
ONE PIPE GRAVITY HOT WATER SYSTEM

**Obsolete**

# The Evolution of Heating Systems

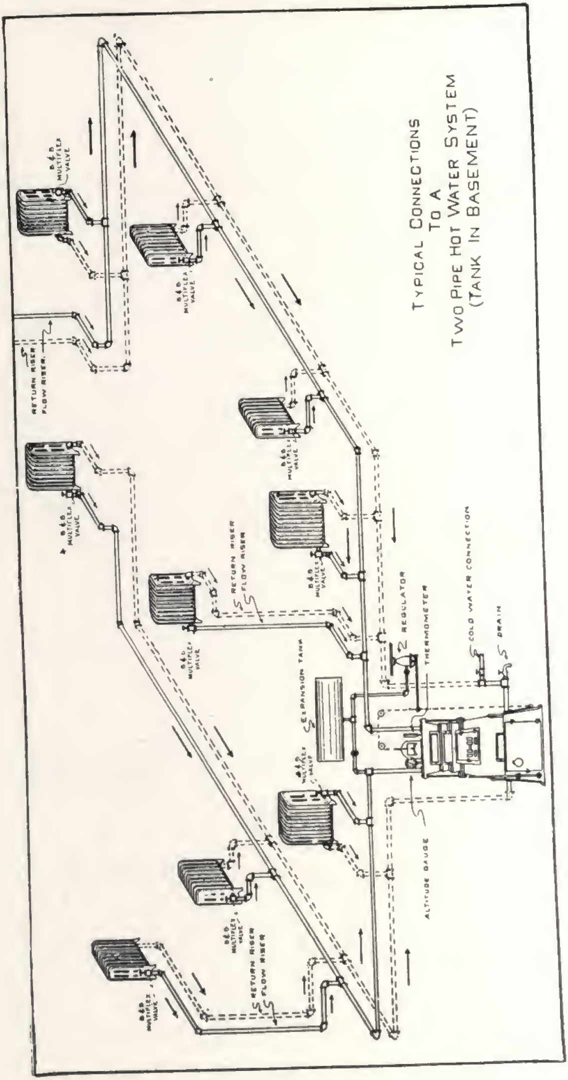


# The Evolution of Heating Systems

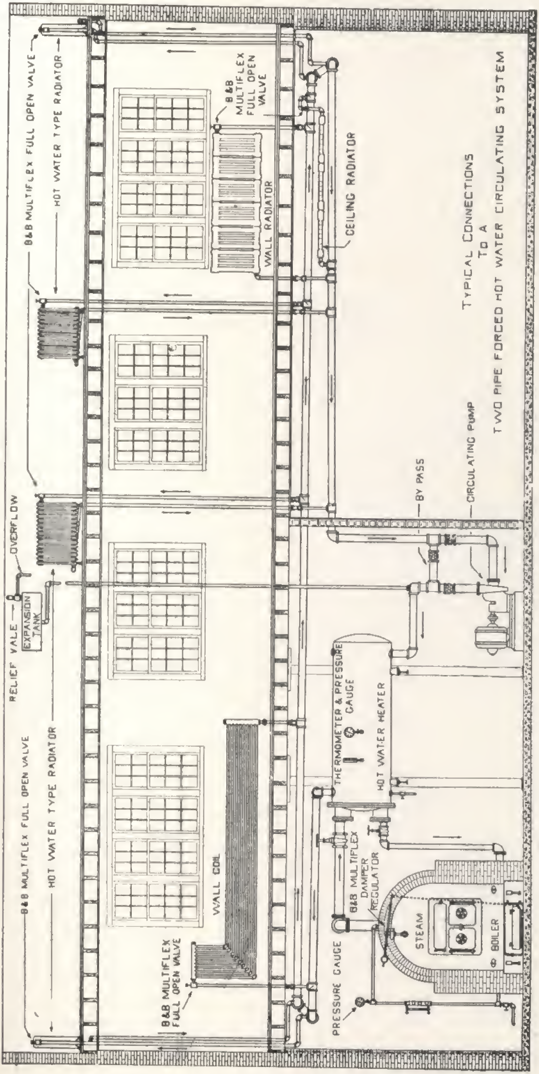


TYPICAL CONNECTIONS TO A TWO PIPE HOT WATER HONEYWELL SYSTEM

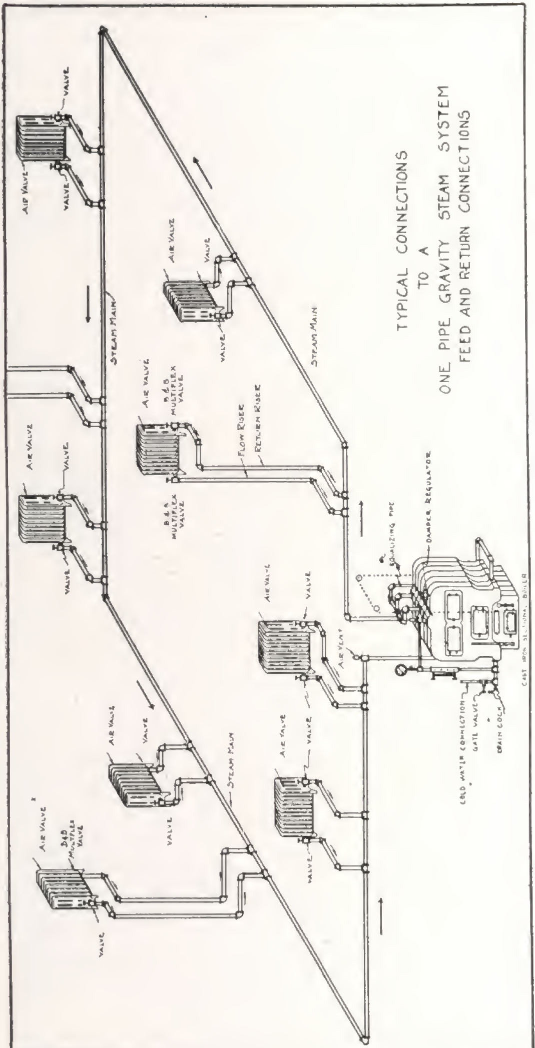
# The Evolution of Heating Systems



# The Evolution of Heating Systems

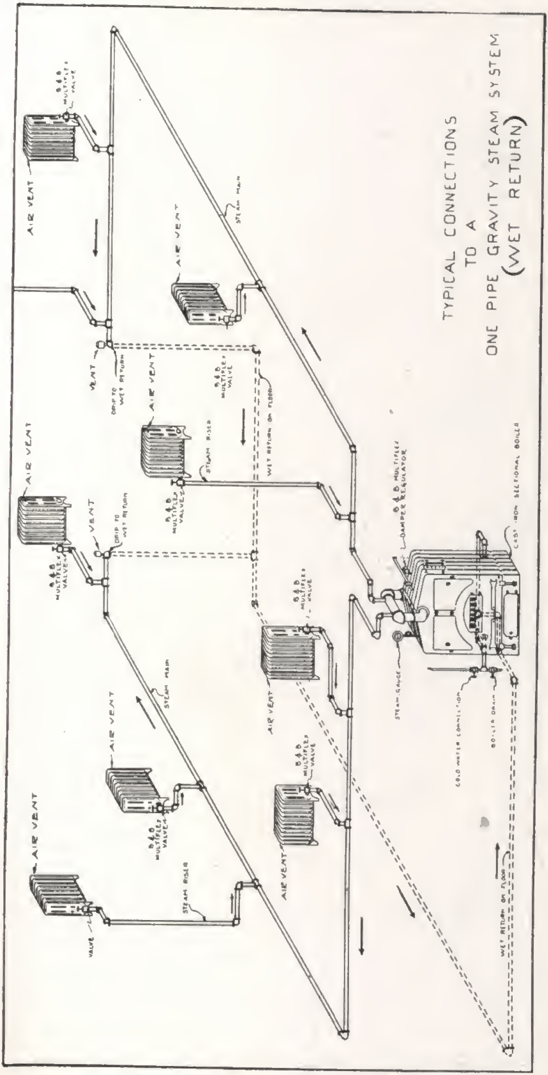

B&B MULTIFLEX FULL OPEN VALVE
HOT WATER TYPE RADIATOR
RELIEF VALE
EXPANSION TANK
OVERFLOW
B&B MULTIFLEX FULL OPEN VALVE
HOT WATER TYPE RADIATOR
B&B MULTIFLEX FULL OPEN VALVE
WALL COIL
WALL RADIATOR
B&B MULTIFLEX FULL OPEN VALVE
CEILING RADIATOR
PRESSURE GAUGE
B&B MULTIFLEX DAMPER REGULATOR
STEAM
BOILER
THERMOMETER & PRESSURE GAUGE
HOT WATER HEATER
BY PASS
CIRCULATING PUMP
TYPICAL CONNECTIONS TO A TWO PIPE FORCED HOT WATER CIRCULATING SYSTEM

# The Evolution of Heating Systems

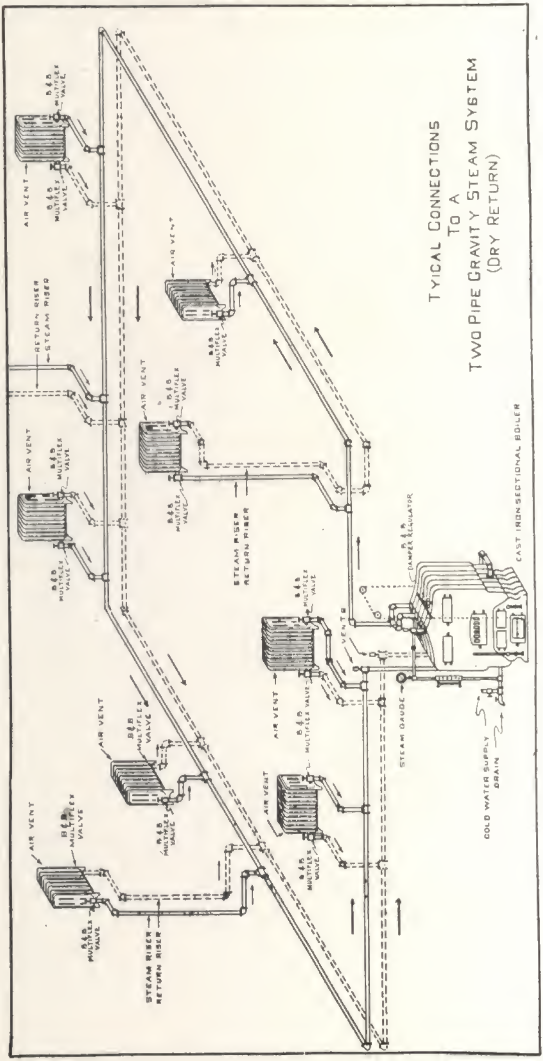


**Obsolete**

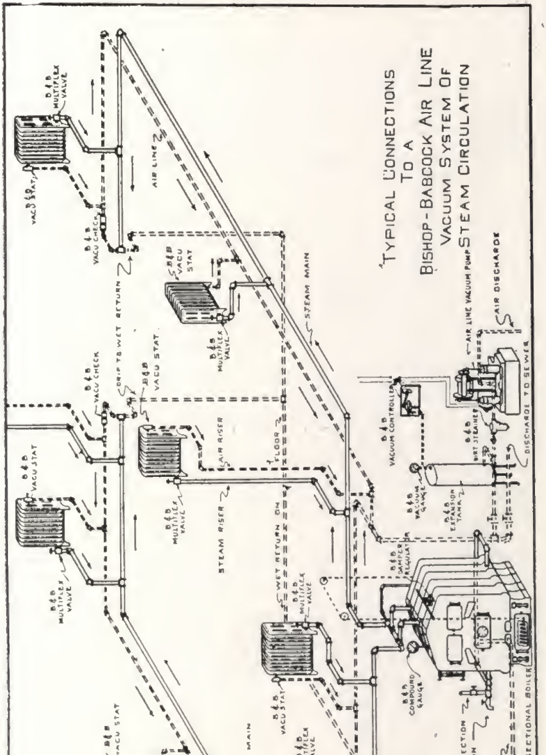
# The Evolution of Heating Systems



# The Evolution of Heating Systems

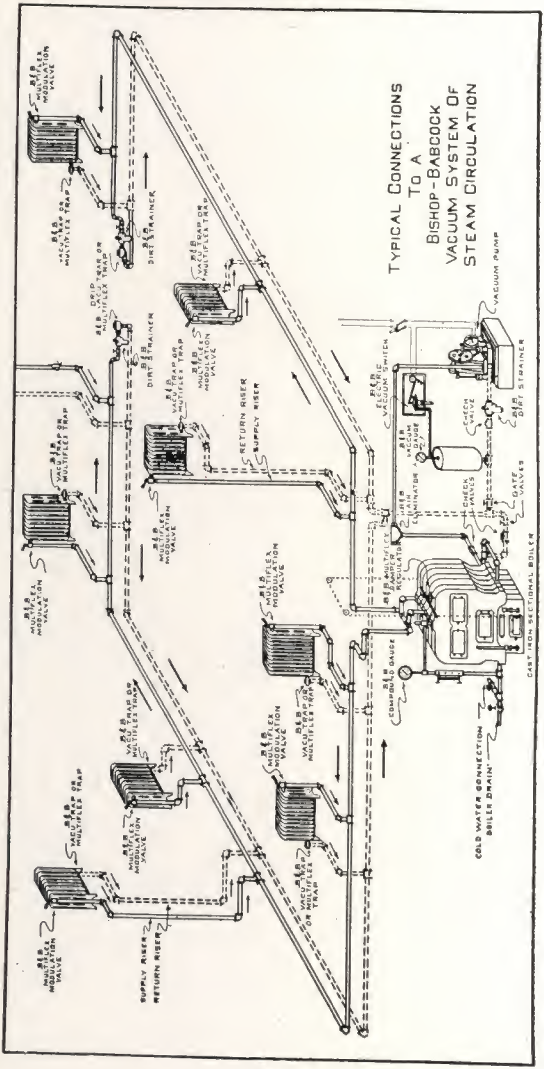

TYICAL CONNECTIONS
TO A
TWO PIPE GRAVITY STEAM SYSTEM
(DRY RETURN)

# Typical Details
## Modern Heating Systems


Typical Connections To A Bishop-Babcock Air Line Vacuum System Of Steam Circulation

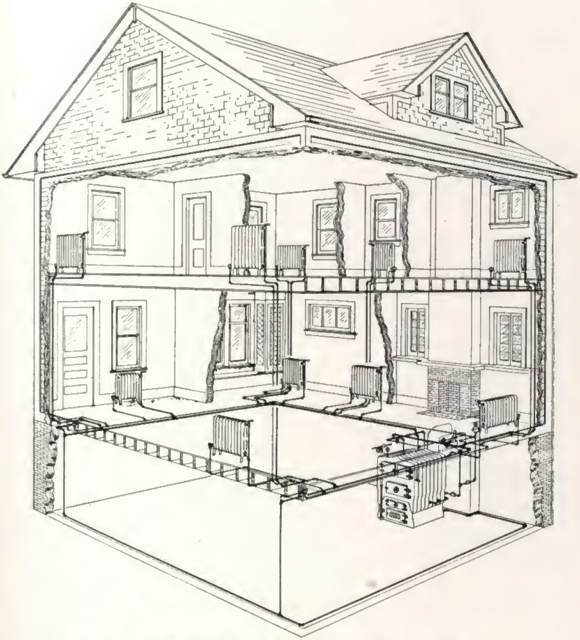
# Typical Details

## Modern Heating Systems



# Typical Details

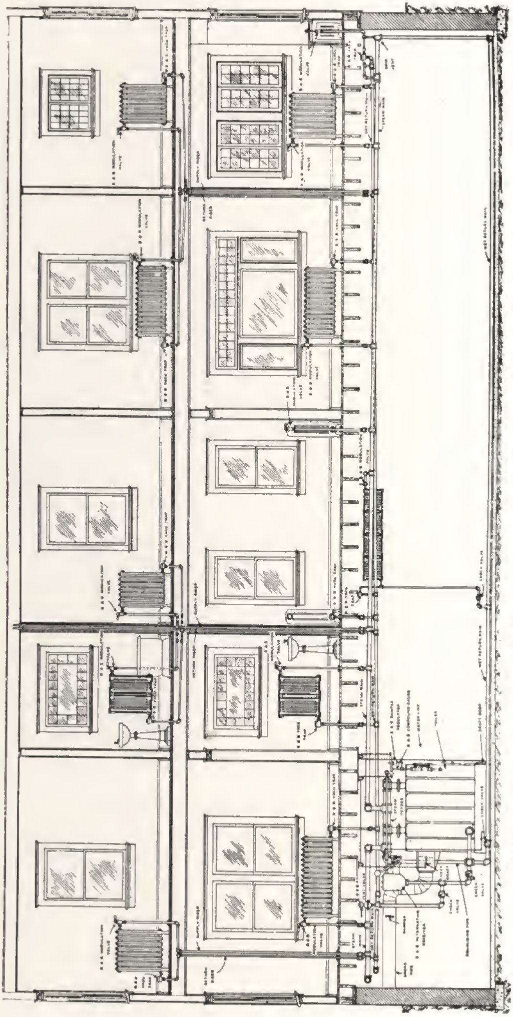
## Modern Heating Systems



Typical Installation of a Bishop-Babcock Vacu-Vapor System of Steam Circulation

# Typical Details

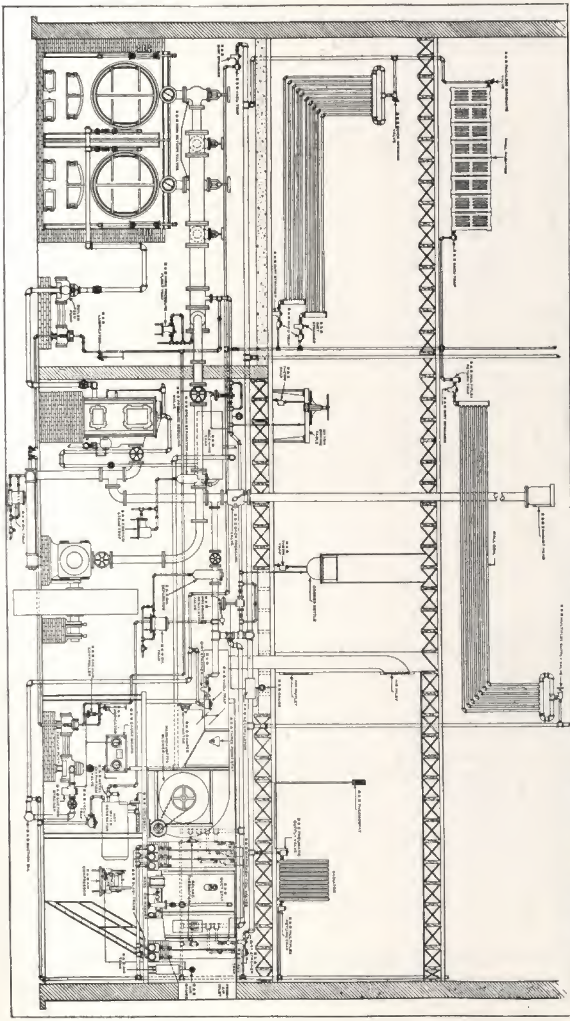
## Modern Heating Systems



Typical Connections to a Bishop-Babcock Varu-Vapor System of Steam Circulation

# Typical Details

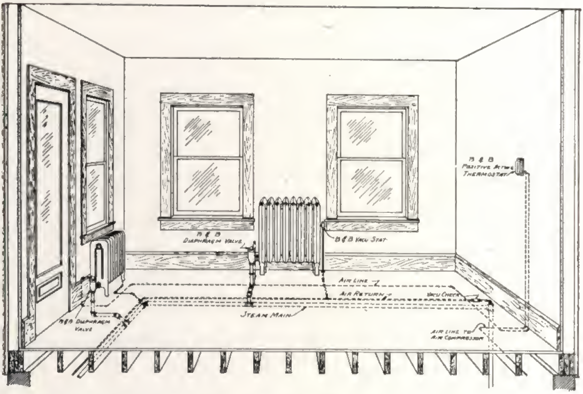
## Modern Heating Systems



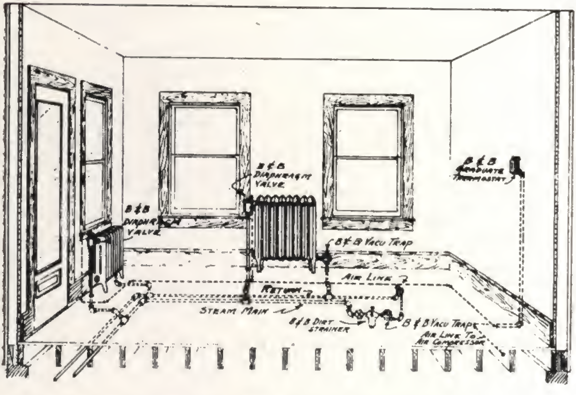
Typical Connections to a Bishop-Babcock Vacuum System of Steam Circulation—Using Exhaust Steam

# Typical Details

## Modern Heating Systems



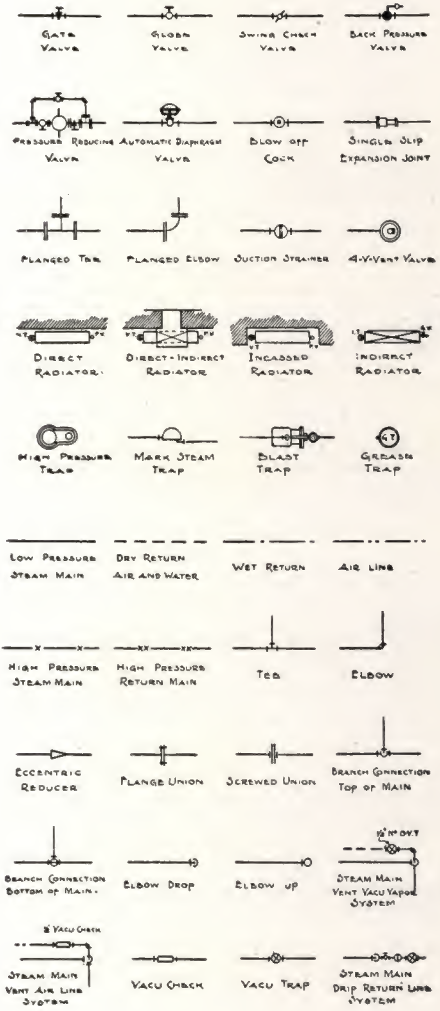
**Typical Installation Showing B&B Temperature Control in Connection With a One Pipe Air Line Vacuum System (Positive Thermostat)**



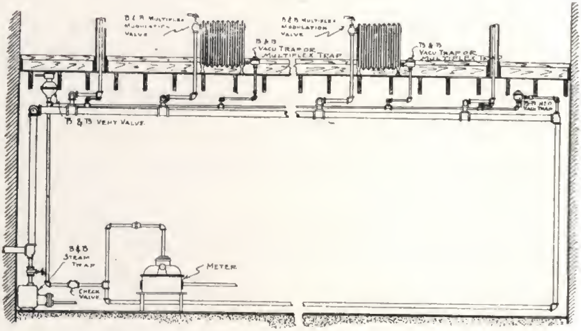
**Typical Installation Showing B&B Temperature Control in Connection With a Two Pipe Vacuum System (Graduate Thermostat)**

# Typical Details

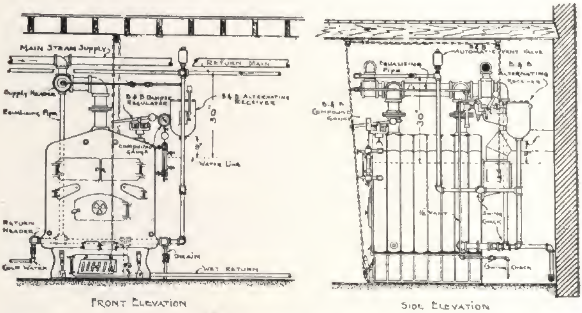
## Standard Symbols for Heating and Ventilating Plans



# Typical Details
## Modern Heating Systems


B & B Multiplex Modulation Valve
B & B Multiplex Modulation Valve
B & B Vacu Trap or Multiplex Trap
B & B Vacu Trap or Multiplex Trap
B & B Vent Valve
B & B No. 0 Vacu Trap
B&B Steam Trap
Check Valve
Meter

Typical Meter Connections Central Station Steam Service as Applied to the Bishop-Babcock Vacu Vapor System of Steam Circulation



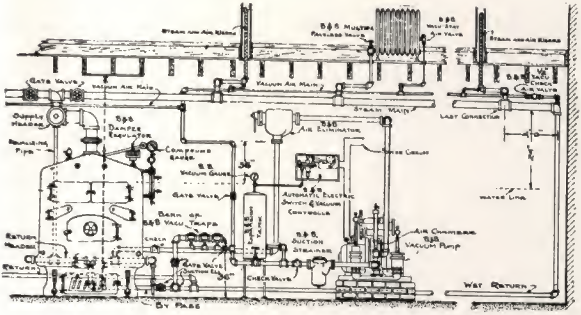
Front Elevation

Side Elevation

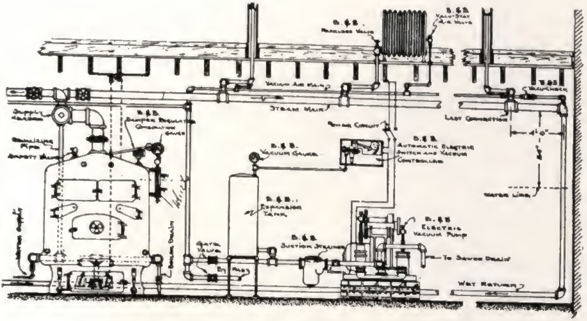
Typical Connections to B&B Alternating Receiver as Applied to the Bishop-Babcock Vacu Vapor System of Steam Circulation

# Typical Details

## Modern Heating Systems

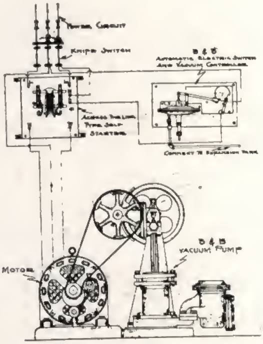


Typical Connections to a Bishop-Babcock Combination Air Line and Return Vacuum System of Steam Circulation

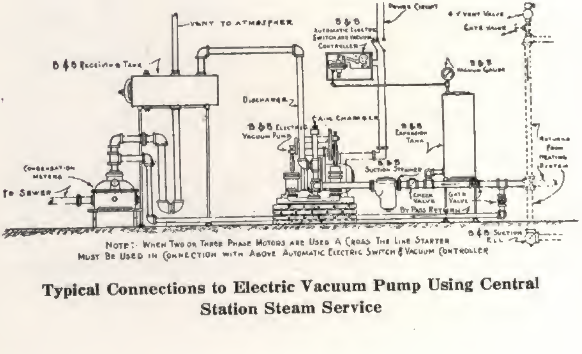


Typical Connections to the Bishop-Babcock Air Line Vacuum System of Steam Circulation

# Typical Details



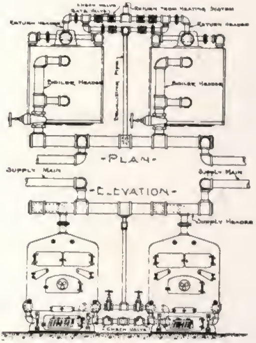
Typical Wiring Diagram for Vacuum Regulator and Across the Line Type Self Starter as Applied to (Three Phase Motors)



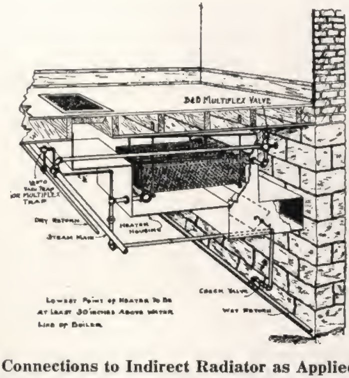
Note:- When Two or Three Phase Motors are Used A Cross The Line Starter Must Be Used in Connection with Above Automatic Electric Switch & Vacuum Controller

Typical Connections to Electric Vacuum Pump Using Central Station Steam Service

# Typical Details

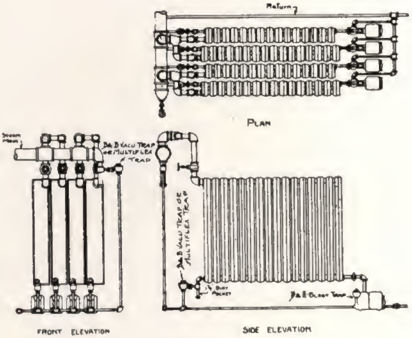


Typical Connections to Two Cast Iron Boilers


B&B Multiflex Valve
B&B Vacu Trap or Multiflex Trap
Dry Return
Heater Housing
Steam Main
Check Valve
Wet Return
Lowest Point of Heater To Be At Least 30 inches Above Water Line of Boiler

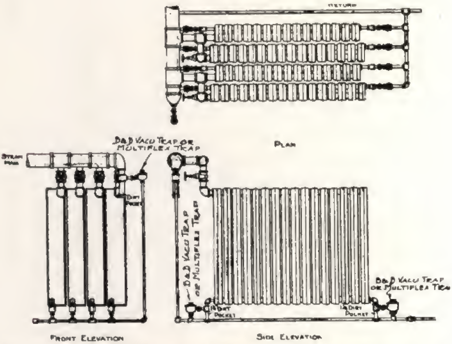
Typical Connections to Indirect Radiator as Applied to B&B Vacu Vapor Systems of Steam Circulation

# Typical Details



Install swing check in each return if temperature control is used

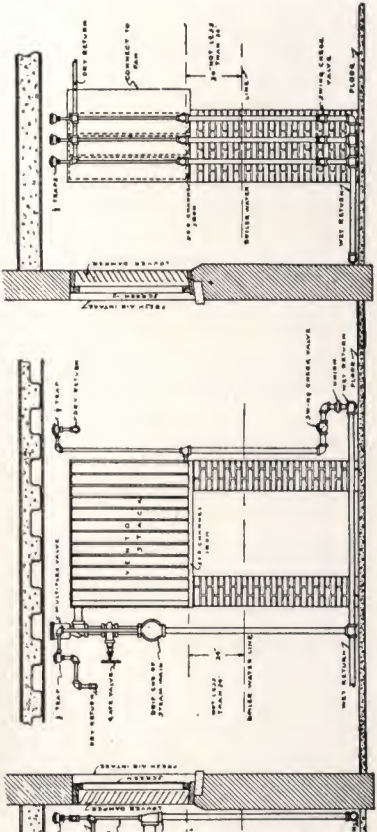
**Typical Connections to Vento Heaters Using B&B Blast Traps as Applied to the Bishop-Babcock Vacuum System of Steam Circulation**


Return
Plan
B&B Vacu Trap or Multiflex Trap
Steam Main
Dirt Pocket
B&B Vacu Trap or Multiflex Trap
1½ Dirt Pocket
1½ Dirt Pocket
B&B Vacu Trap or Multiflex Trap
Front Elevation
Side Elevation

Install swing check in each return if temperature control is used.

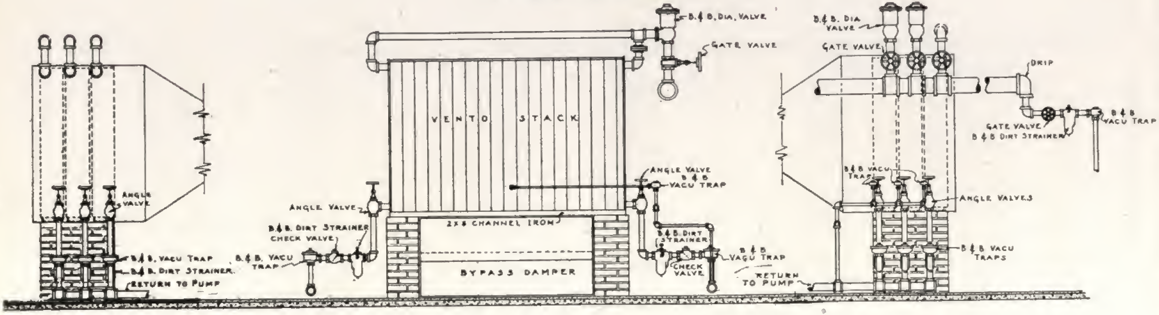
**Typical Connections to Vento Heaters Using B&B Multiflex Traps as Applied to the Bishop-Babcock Vacuum System of Steam Circulation**

## Typical Details



Typical Method of Providing Connections to Vento Stacks as Applied to Bishop-Babcock Vacu-Vapor System of Steam Circulation

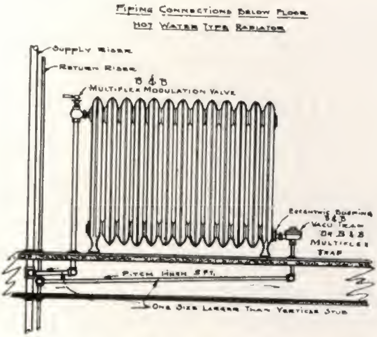
## Typical Details



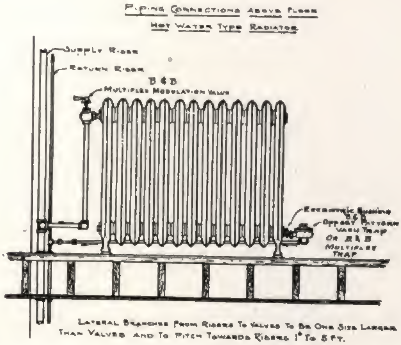
Side Elevation    Elevation    Side Elevation

Typical Method of Providing Connections to Vento Stacks as Applied to Bishop-Babcock Vacuum System of Steam Circulation

# Typical Details

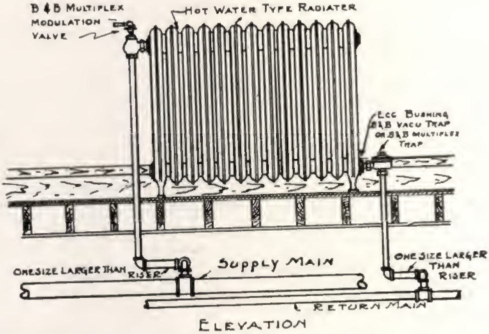

Piping Connections Below Floor
Hot Water Type Radiator
Supply Riser
Return Riser
B & B Multiflex Modulation Valve
Eccentric Bushing
B & B Vacu Trap Or B & B Multiflex Trap
Pitch High 5 Ft.
One Size Larger Than Vertical Stub

**Typical Connections to Hot Water Type Radiator as Applied to the Bishop-Babcock Vacu Vapor or Vacuum System of Steam Circulation**

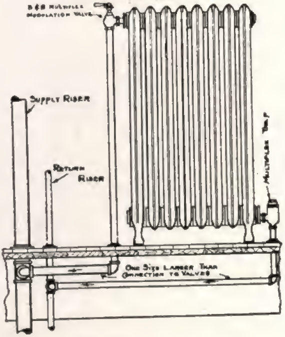

Piping Connections Above Floor
Hot Water Type Radiator
Supply Riser
Return Riser
B & B Multiflex Modulation Valve
Eccentric Bushing
B & B Offset Pattern Vacu Trap Or B & B Multiflex Trap
Lateral Branches From Risers To Valves To Be One Size Larger Than Valves And To Pitch Towards Risers 1" To 5 Ft.

**Typical Connections to Hot Water Type Radiators as Applied to the Bishop-Babcock Vacu Vapor or Vacuum System of Steam Circulation**

# Typical Details

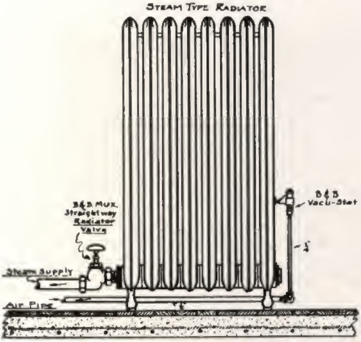

B & B Multiplex Modulation Valve
Hot Water Type Radiater
Ecc Bushing B & B Vacu Trap or B & B Multiplex Trap
One size larger than riser
Supply Main
One size larger than riser
Return Main
Elevation

Typical Connections to Hot Water Type Radiator as Applied to the Bishop-Babcock Vacu Vapor or Vacuum System of Steam Circulation

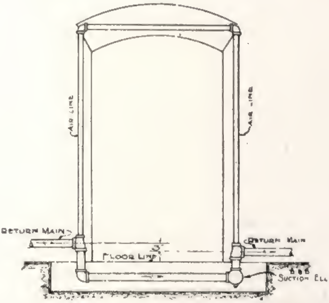

B & B Multiplex Modulation Valve
Hot Water Type Radiator
Supply Riser
Return Riser
Multiplex Trap
One Size Larger Than Connection to Valves

Typical Connection to Hot Water Radiator as Applied to the Bishop-Babcock Vacu Vapor or Vacuum System of Steam Circulation

# Typical Details



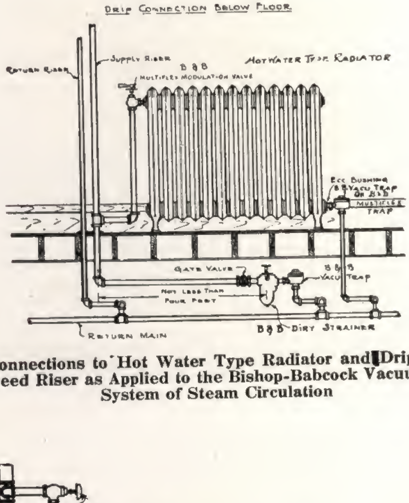
**Typical Connections to Steam Type Radiator as Applied to B&B Air Line System of Steam Circulation**



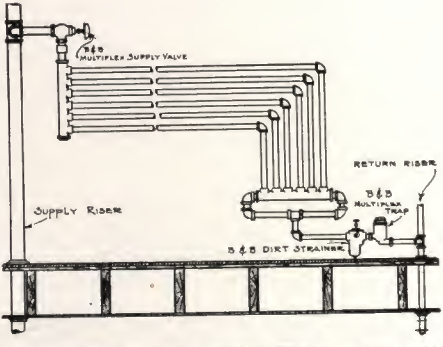
SIZE OF AIR LINE ¾ INCH FOR RETURN MAINS FROM 1-INCH TO 2 INCH, ABOVE 2 INCH MAKE AIR LINE 1 INCH

**Typical Connection Where Return Passes Under Doorways as Applied to the Bishop-Babcock Vacuum System of Steam Circulation**

# Typical Details

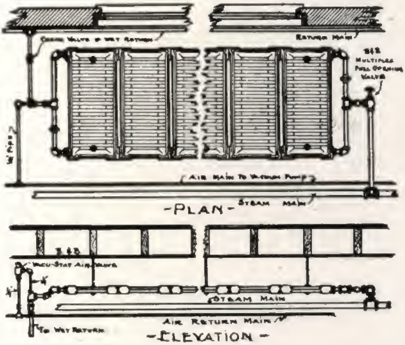


Typical Connections to Hot Water Type Radiator and Drip of Down Feed Riser as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

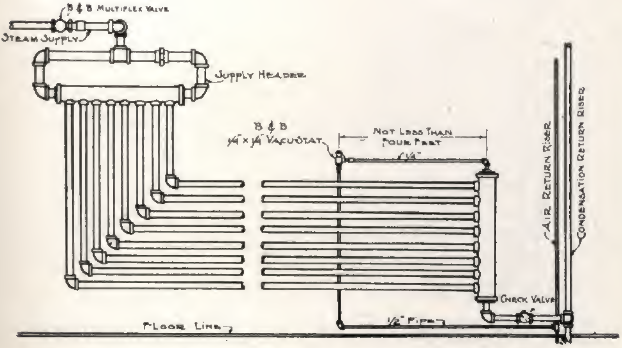


Typical Connections to Pipe Coil Showing Header on Return as Applied to B&B Vacuum System of Steam Circulation

# Typical Details

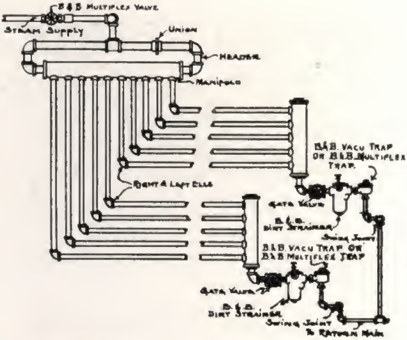


Typical Connections to Wall Type Radiator as Applied to B&B Air Line System of Steam Circulation

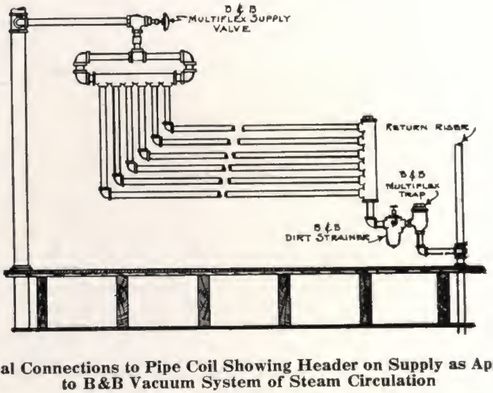


Typical Connections to Pipe Coil as Applied to B&B Air Line System of Steam Circulation

## Typical Details

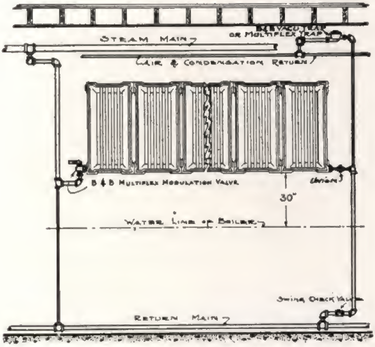


**Typical Connections to Pipe Coil of More than 6 Pipes as Applied to B&B Vacuum System of Steam Circulation**

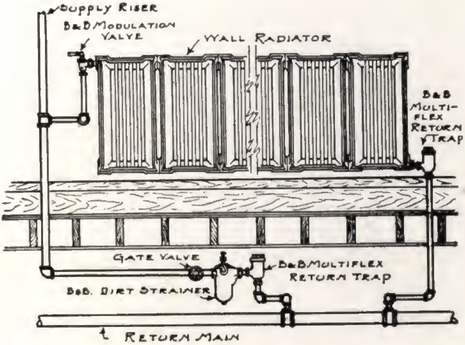


**Typical Connections to Pipe Coil Showing Header on Supply as Applied to B&B Vacuum System of Steam Circulation**

# Typical Details

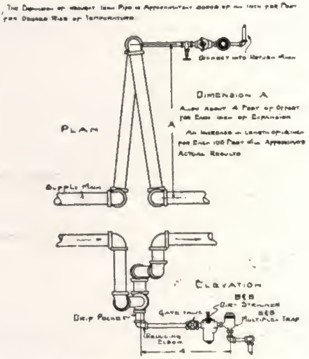

B&B VACU TRAP OR MULTIFLEX TRAP
STEAM MAIN
AIR & CONDENSATION RETURN
B & B MULTIFLEX MODULATION VALVE
Union
30"
WATER LINE OF BOILER
SWING CHECK VALVE
RETURN MAIN

Typical Connections to Wall Type Radiators on Same Floor Level as Boiler as Applied to B&B Vacu Vapor System of Steam Circulation

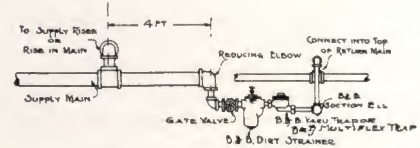


Typical Connections to Wall Type Radiators and Drip on Down Feed Riser as Applied to B&B Vacuum System of Steam Circulation

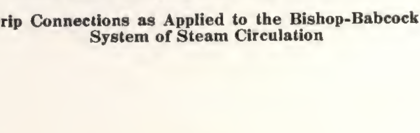
# Typical Details



Typ'cal Connections of Expansion Joint for Supply Mains as Applied to the Bishop-Babcock Vacuum System of Steam Circulation


To Supply Riser or Rise in Main
4 FT.
Reducing Elbow
Supply Main
B&B Dirt Strainer
B.&B. Vacu Trap or B&B Multiflex Trap
Connect into Top of Return Main
Gate Valve
Return Main

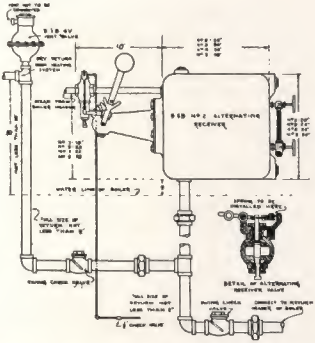
-Where Return Main is Below Supply Main-


4 FT
To Supply Riser or Rise in Main
Reducing Elbow
Connect into Top of Return Main
Supply Main
B&B Suction Ell
Gate Valve
B.&B. Vacu Trap or B&B Multiflex Trap
B.&B. Dirt Strainer

-Where Return is on Same Level or Above Supply Main-

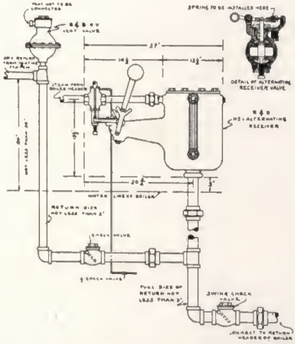
Typical Drip Connections as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

# Typical Details


B&B V VENT VALVE
10'
STEAM FROM BOILER HEADER
B&B No 2 ALTERNATING RECEIVER
WATER LINE OF BOILER
SPRING TO BE INSTALLED HERE
SWING CHECK VALVE
DETAIL OF ALTERNATING RECEIVER VALVE
SWING CHECK VALVE
CONNECT TO RETURN HEADER OF BOILER

**Typical Connections to the B&B No. 2 Alternating Receiver as Applied to the Bishop-Babcock Vacu Vapor System of Steam Circulation**

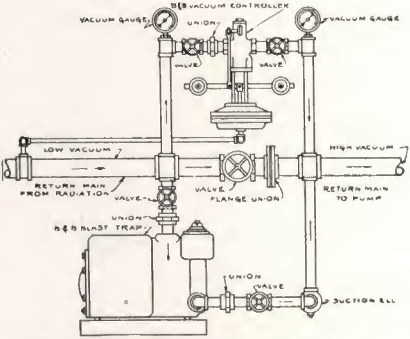
NOTE:—Wet Return Connection to be made only between Lower Check and Boiler.


VENT NOT TO BE CONNECTED
B&B V VENT VALVE
SPRING TO BE INSTALLED HERE
27"
14½"
12½"
DETAIL OF ALTERNATING RECEIVER VALVE
STEAM FROM BOILER HEADER
B&B No 1 ALTERNATING RECEIVER
20½"
WATER LINE OF BOILER
RETURN SIZE NOT LESS THAN 2"
CHECK VALVE
FULL SIZE OF RETURN NOT LESS THAN 2"
SWING CHECK VALVE
CONNECT TO RETURN HEADER OF BOILER

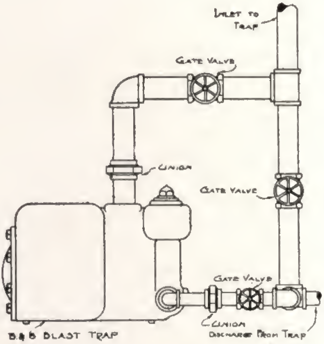
**Typical Connections to the B&B No. 1 Alternating Receiver as Applied to the Bishop-Babcock Vacu Vapor System of Steam Circulation**

NOTE:—Wet Return Connection to be made only between Lower Check and Boiler.

# Typical Details

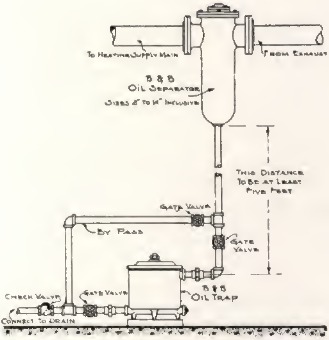


Typical Arrangement of Piping for High and Low Vacuum as Applied to Central Heating Plants

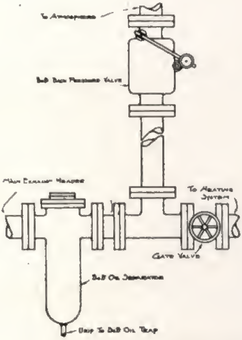


Typical By-Pass Connections to B&B Blast Trap

# Typical Details

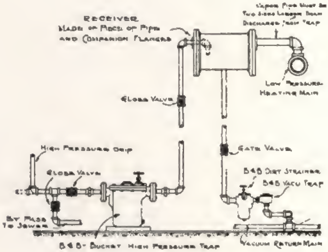


Typical Connection to B&B Oil Separator and B&B Oil Trap as Applied to the Bishop-Babcock Vacuum System of Steam Circulation



Typical Connections to B&B Back Pressure Valve and B&B Oil Separator as Applied to the Bishop-Babcock Vacuum System of Steam Circulation (Using Exhaust Steam)

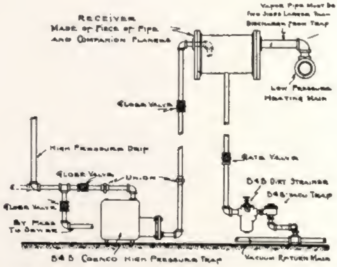
# Typical Details


Receiver
Made of Piece of Pipe and Companion Flanges
Vapor Pipe Must Be Two Sizes Larger Than Discharge from Trap
Low Pressure Heating Main
Globe Valve
High Pressure Drip
Gate Valve
Globe Valve
B&B Dirt Strainer
B&B Vacu Trap
By Pass To Sewer
B&B Bucket High Pressure Trap
Vacuum Return Main

ELEVATION

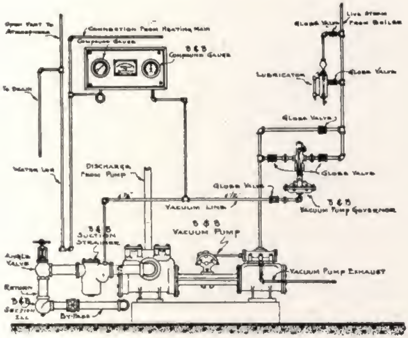
NOTE ~ Size of Receiver and Vacu Trap To Be Determined From The Amount of Condensation Discharged By The High Pressure Trap

**Typical Connections to High Pressure Drip, Low Pressure Drip and Vacuum Return Main as Applied to the Bishop-Babcock Vacuum System of Steam Circulation Using Bucket Type Trap.**

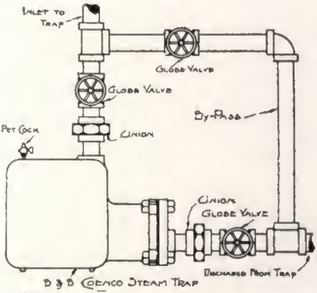

Receiver
Made of Piece of Pipe and Companion Flanges
Vapor Pipe Must Be Two Sizes Larger Than Discharge from Trap
Low Pressure Heating Main
Globe Valve
High Pressure Drip
Gate Valve
Globe Valve
Union
B&B Dirt Strainer
B&B Vacu Trap
Globe Valve
By Pass To Sewer
B&B Cobenco High Pressure Trap
Vacuum Return Main

**Typical Connections to High Pressure Drip, Low Pressure Drip and Vacuum Return Main as applied to the Bishop-Babcock Vacuum System of Steam Circulation Using A Float Type Trap**

# Typical Details



Typical Connections to Steam Operated Vacuum Pump as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

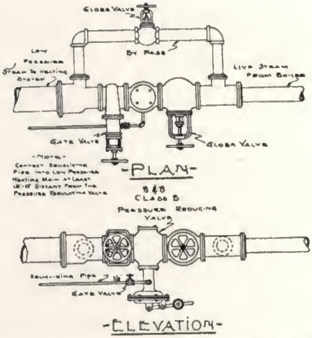


Note—

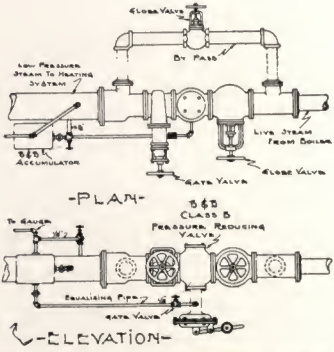
Where (2) Two or More Cemco Steam Traps Discharge into the same line, a swing check valve shall be installed on each discharge from trap.

Typical By-Pass Connections to B&B High Pressure Float Type of Trap

# Typical Details


Globe Valve
By Pass
Low Pressure Steam to Heating System
Live Steam From Boiler
Gate Valve
Globe Valve
-Note-
Connect Equalizing Pipe into Low Pressure Heating Main at Least 10'-0" Distant From the Pressure Regulating Valve
-PLAN-
B&B
Class B
Pressure Reducing Valve
Equalizing Pipe
1/4"
Gate Valve
-ELEVATION-

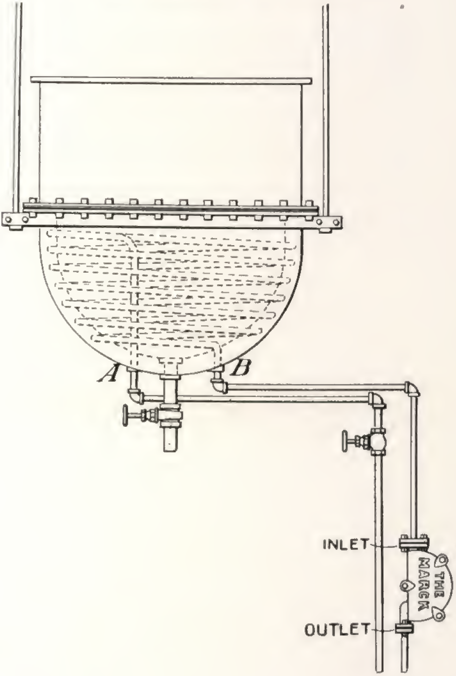
Typical Connections Around the B&B Pressure Regulating Valve as Applied to the Bishop-Babcock Vacuum System of Steam Circulation

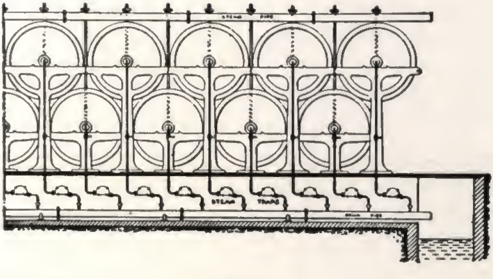


Typical Connections Around B&B Pressure Regulating Valve and Accumulator as Applied to the Bishop-Babcock System of Steam Circulation

# Typical Details

## Typical Connection Marck Trap to Industrial Apparatus





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